F I N A L

REMOVAL ACTION WORKPLAN (RAW)

Former University of California
Bay Area Research and Extension Center (BAREC)
90 North Winchester Boulevard
Santa Clara, California

Prepared for:
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October 2007
Project No. 03-10609A

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LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
BAREC	Bay Area Research and Extension Center
bgs	below ground surface
Cal/EPA	California Environmental Protection Agency
CalTrans	California Department of Transportation
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
cm^2	Square centimeter
COPC	Chemical of Potential Concern
DEH	City of Santa Clara Department of Environmental Health
4,4'-DDD	4,4'-Dichorodiphenyldichloroethane
4,4'-DDE	4,4'-Dichorodiphenyldichloroethene
4,4'-DDT	4,4'-Dichorodiphenyltrichloroethane
DTSC	Department of Toxic Substances Control
EIR	Environmental Impact Report
kg	Kilogram
LBNL	Lawrence Berkeley National Laboratory
m^3/day	cubic meters per day
mg/cm^2	milligrams per square centimeter
mg/day	milligrams per day
mg/kg	milligrams per kilogram
mg/m^3	milligrams per cubic meter
mm of Hg	millimeters of mercury
MRL	Method Reporting Limit
MSL	Mean Sea Level
NA	Not Applicable
NCP	National Contingency Plan
ND	Not Detected
NR	Not Reported
PEA	Preliminary Endangerment Assessment
PRG	Preliminary Remediation Goal
RA	Removal Action
RAL	Recommended Action Level
RAOs	Removal Action Objectives
R&D	Research and Development
TBCs	To Be Considered
T&CVSC	Town and Country Village Shopping Center
UC	University of California
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

An environmental investigation was conducted at the former University of California (UC) Bay Area Research and Extension Center (BAREC) in Santa Clara, California (the site) to determine whether prior agricultural research operations had impacted soil. Residential development is planned for the site in the future. The State of California has closed the BAREC and plans to sell the property for development of single-family homes, open space and senior housing.

The results of the environmental investigation recommended that a removal action be performed to address elevated concentrations of arsenic in the eastern sector of Field 4, and the three "hot spots" in surface soil. A Removal Action Workplan ("RAW") was prepared to identify, evaluate, and recommend remediation alternatives for contaminated soils at the site. The primary objective of this RAW is to ensure the protection of human health and the environment.

Background

Since the 1920s, the BAREC was used as an agricultural research station. The primary research efforts at the BAREC have focused on improving crop production methods, irrigation systems, nutrition and variety characteristics of crops, and crop disease control. Part of this research has involved demonstrating the efficacy of a variety of research and development (R&D) pesticides. Monthly records of pesticide use were available from 1979 until the July 2002. These records indicated that small quantities of 90 different chemicals had been tested on crops at the site. Fourteen of these 90 chemicals were considered of potential concern because of their toxicity and persistence in the environment. The remaining chemicals were not of potential concern because of their lack of persistence and/or low toxicity.

Environmental Investigation

As a result of the application of pesticides to soil and the handling of pesticides on-site, over 50 samples of surface soil were collected to determine if surface soil in field plots and the greenhouses contained pesticide residues. These samples were analyzed for chemicals/pesticides that may persist in soil for many years following application. The chemicals analyzed included the 14 chemicals of potential concern, known to have been used at the site, and 60 pesticides that were commonly used prior to 1979. Subsurface soil samples were also collected and analyzed from a former sewer leach pit, the former evaporation pond, and former sediment trap to determine if deeper subsurface soil and potentially ground water beneath the site contained pesticide residues.

Investigation Results

Arsenic and dieldrin were the chemicals of potential concern that were found at concentrations above USEPA Region 9 Preliminary Remediation Goals (PRGs) in surface soil. Elevated concentrations of dieldrin were isolated and of limited horizontal and vertical extent. However, the dieldrin concentration in surface soil in Field 1 exceeded the PRG. As a result, it is recommended that this "hot spot" of dieldrin be addressed.

An area in the eastern portion of Field 4 had elevated concentrations of arsenic in surface soil relative to background levels and other areas at the site. These results suggest that the elevated concentrations of arsenic in Field 4 may be a result of prior use of arsenical pesticides. There were also two additional areas that had isolated, elevated concentrations of arsenic: 1) adjacent to the road in front of the former screen house, a less than five square foot area of distressed vegetation had an elevated concentration (37 mg/kg) of arsenic in surface soil; and 2) between Field 11 and 12, there is an elevated concentration (27 mg/kg) of arsenic in surface soil. Based on these results, a removal action was recommended to address the elevated concentrations of arsenic in the eastern sector of Field 4, and the three "hot" spots in surface soil.

Removal Action Alternatives

The removal action objectives (RAOs) for the site are:

- Minimize exposure of future site residents to surface soil containing arsenic above the 20 mg/kg level,
- Ensure the mean concentration of dieldrin in an individual field is below 30 ug/kg; and
- Leave the site in a physical condition that is compatible with single-family residential use.

Three removal action alternatives were evaluated based on their ability to meet RAOs, effectiveness, implementablility and cost. The three alternatives included: 1) No Action; 2) Capping and Implementation of Institutional Controls; and, 3) Excavation with Offsite Disposal..

The recommended alternative was excavation and offsite disposal of soil. Soil above cleanup goals would be excavated from the site and disposed of at a nearby nonhazardous, municipal landfill. The overall average arsenic concentration in shallow soil would be 12 mg/kg and the average dieldrin concentration in Field 1 less than 30 ug/kg following implementation of the recommended removal action alternative. Up to roughly 6000 cubic yards of soil are anticipated to be excavated over an approximately 2-week period from Field 4 and the three hot spots. Confirmation samples will be collected from the excavation areas prior to backfilling with clean import fill. Air monitoring and dust control measures will be implemented during removal action activities. The estimated cost of implementation of the removal action alternative is approximately $800,000. The anticipated time to implement the removal action at the site is 6 weeks.

1.0 INTRODUCTION

This Removal Action Workplan (RAW) was prepared by ENVIRON International Corporation (ENVIRON), an environmental consulting firm, on behalf of the State of California Department of General Services (DGS) to address the presence of contaminated soil at the former University of California (UC) Bay Area Research and Extension Center (BAREC) site ("the site"). The RAW has been prepared in a manner consistent with the National Contingency Plan (NCP) and in accordance with California Health and Safety Code, Section 25356.1. The RAW is also being prepared under a Voluntary Cleanup Agreement between the DGS and the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) dated May 12, 2003. An Environmental Impact Report (EIR) is being prepared by the City of Santa Clara for the proposed development project and site clean-up to comply with the requirements of the California Environmental Quality Act (CEQA)

The purpose of this RAW is to identify, evaluate, and recommend remediation alternatives for contaminated soils at the site. Selection of one alternative is based upon an analysis of the effectiveness, implementability and cost of each alternative. The primary objective of this RAW is to ensure the protection of human health and the environment. Residential development is planned for the site in the future.

2.0 SITE CHARACTERIZATION

2.1. SITE DESCRIPTION AND BACKGROUND

The site is located at 90 North Winchester Boulevard in the City of Santa Clara, California. The location of the site is presented on Figure 1. The site is an approximately 17-acre, roughly rectangular-shaped property. As shown in Figure 2, 12 small buildings are located on the eastern portion of the site. The remainder of the property consists of agricultural fields, unpaved roadways and a paved parking area. The fields are identified by a number from one through twelve and cover a total of approximately eleven acres. Field 9 is enclosed by screens, which form a covered building over the field. Unpaved roadways provide access to the fields. The only paved area at the site is the northwest corner of the property, where buildings 100, 103, 104, 105, 201 and 204 are located. This paved area is used for parking.

2.1.1. Site History

According to facility personnel, the site was originally occupied by a veterans' widows home. Agricultural experimental field station operations at the site began in 1928. The home remained in operation until the 1960s, when it was demolished and replaced with more agricultural fields. According to historical topographical maps, the name of the facility used to be Holderman Sanitarium. Based on a review of historical titles and deeds, obtained from the DGS, four lots owned by Margaret Osborne were deeded to the State of California in 1921 and 1924. The four lots were incorporated into three lots, two of which were deeded by the State of California to the UC in 1952 and 1963. The third lot, located directly southwest of the site, remained property of the State of California, and is currently occupied by an office building, which is occupied by the Department of Veterans' Affairs.

The field station's initial purpose was to assist farmers in the surrounding area. Until 1990, deciduous fruit trees (such as apples, citrus, cherries, almonds and ornamental) were planted to conduct research on fertilizers, irrigation, variety characteristics of crops, and crop disease control. Part of this research has involved demonstrating the efficacy of a variety of research and development (R&D) pesticides. Monthly records of pesticide use were available from 1979 until July 2002. These records indicated that small quantities of 90 different chemicals had been tested on crops at the site. As the surrounding area changed and became urban, the trees were replaced with various crops, such as strawberries, corn, tomatoes, beans and flowers. Since about 1995, eighty percent of the research at BAREC has focused on crop improvement, whereas only twenty percent has involved pesticide use (UC, 2002). In early 2003, UC closed the BAREC. As part of closure, UC personnel removed all hazardous materials (i.e. fertilizers, pesticides, fuels, oils, cleaning solutions), portable tanks and trailers from the site. The buildings and related utilities remain in place at the site.

2.1.2. Geology

The site is located near the center of the South Bay hydrologic sub-basin of the San Francisco Bay hydrologic basin, which is located in the Coast Ranges geomorphic province. The Coast Ranges geomorphic unit is characterized by predominantly northwest trending mountains, valleys and faults. The South Bay unit is a broad alluvial valley sloping north toward San Francisco Bay. The site is underlain by Quaternary alluvium deposited by streams that merge near the center of the San Jose Alluvial Plain and flow north toward San Francisco Bay. The alluvium is composed of unconsolidated interbedded gravel, sand silt and clay. The alluvium becomes progressively finer-grained northward toward the Bay and contains a series of laterally extensive marine clay layers (Dames and Moore 1988).

The site is likely within or on the margin of the area underlain by extensive clay layers (Dames and Moore 1988). According to documentation provided by the UC for the irrigation well at the site, interbedded gravel, sand and clay was observed at the site to a depth of 39 feet. The gravel was underlain by layers of clay, sandy clay, gravelly clay and gravel to a depth of 360 feet. Blue clay was reported at depths of 70 to 75 feet, 105 to 119 feet, 239 to 244 feet, and 261 to 272 feet, which is consistent with the interpretation that the site is on the margin of the area underlain by extensive clay layers.

2.1.3. Hydrogeology

The alluvial deposits of the Santa Clara Valley basin are generally regarded as a complex series of coalescing alluvial fans. Sediments deposited by meandering stream channels on the fans resulted in a complex stratigraphic sequence, which trends northeast from the Santa Cruz Mountains toward San Francisco Bay and its estuarine areas. The alluvial deposits make up the primary water-yielding aquifers of the Santa Clara Valley, which are grouped into a shallow unconfined to semi-confined aquifer, and a deeper confined aquifer. The deeper confined aquifer is encountered beneath an extensive aquitard, at depths greater than 300 feet below ground surface (bgs) and is considered a viable drinking water source for this area. Recharge to the aquifers is from infiltration of surface waters to the deeper zones (IT Corporation, 1999). Most water wells in the Santa Clara Valley basin withdraw ground water from the Quaternary alluvium (Dames and Moore 1988). Four correlatable regional aquifers have been identified in the alluvial plain; the 60-foot, 250-foot, 350-foot, and 450-foot aquifers. Most major producing wells in the Santa Clara area withdraw water from a zone 150 to 250 feet below ground surface under confined or semi-confined conditions.

Former BAREC personnel indicate that one groundwater well is located on-site. It is located inside the pump house and was used for irrigation of the fields. The well at the site is screened from a depth of 200 to 250 feet bgs; the depth to groundwater in this well is 140 feet and approximately 3.7-million gallons were pumped annually when the BAREC was operating. A report by Environmental Data Resources, Inc. (EDR) identified nine additional active wells within a one-mile radius of the site. The wells are operated by O'Connor Hospital, the San Jose Water Company, the City of San Jose, and the City of Santa Clara. No additional information about these wells was found.

There is no site-specific information on shallow ground water at the site. ENVIRON reviewed a Soil and Ground Water Report prepared by McCulley, Frick & Gilman, Inc. for the Dunn-Edwards Corporation Facility located at 690 Winchester Boulevard, approximately 1/8 mile north of the site. The report indicated that shallow ground water was encountered between 20 and 30 feet bgs and that shallow ground water flowed towards the Bay to the east.

2.2. SOURCE, NATURE AND EXTENT OF IMPACTS

A series of environmental investigations have been conducted at the site. In 1993 and 1987, UC conducted two environmental investigations at the site. These investigations were related to removal of two underground fuel storage tanks and closure of an evaporation bed. In addition, as part of closure and redevelopment of the site, DGS conducted several environmental investigations between July 2002 and April 2003. The overall purpose of the DGS investigations was to determine whether current or past chemical use at the site had resulted in soil concentrations that might pose a threat to public health and the environment. A summary of the results of these investigations is presented below.

2.2.1. Underground Storage Tanks

Two 1,000-gallon fuel tanks were formerly located on-site. The date of installation of the tanks is unknown. A 1000-gallon gasoline UST was located next to Building 201, and a 1000-gallon diesel UST was located next to Building 207 (see Figure 2).

In 1993, UC personnel removed the USTs. The USTs were reportedly in good condition with no evidence of damage or leaks at the time of the removal. As part of removal activities, two samples were taken from approximately two feet below the bottom of the gasoline UST excavation, and one sample was taken from approximately two feet below the bottom of the diesel UST excavation. The soil samples were analyzed for gasoline, diesel, lead, benzene, toluene, ethylbenzene and xylenes. None of these constituents were detected. A letter dated October 7, 1993, from the City of Santa Clara Fire Department confirms that there was no sign of contamination, and that no further work was required.

2.2.2. Former Evaporation Bed

An evaporation bed was constructed in 1973 to dispose of diluted pesticide wastes. Rinsate from the washing of pesticide containers and application equipment was applied to the evaporation bed from 1973 to 1985. Use of the evaporation bed was discontinued in 1985 and inlets to the basin were sealed. In 1987, UC initiated an investigation to close the bed. Prior to its removal, the evaporation bed was sampled in July 1987 by UC staff. Details of the investigation can be found in the *Phase II – Site Characterization Report* (ENVIRON, 2003).

The UC, with the assistance of Dames & Moore, removed the evaporation bed in October 1987. All materials were excavated from inside of the liner and the liner was checked for integrity. After the liner was removed, the underlying two inches of soil were excavated from the bed to minimize possible residual contamination. Additional soil samples were collected by Dames & Moore. Based on the results of the sampling, Dames & Moore concluded that there was no indication that the operation of the former evaporation bed had a significant impact on the environment.

Additional samples were collected from the former pond by ENVIRON on behalf of DGS in April 1, 2003. In the center of the former evaporation pond, the soil samples, which were collected from depths of 2, 3.5, 6.5 and 7.8 feet bgs had arsenic concentrations of 20, 9.7, 2.8, and 2.9 mg/kg respectively. Soil samples collected at depths of 3.5 and 8.5 feet bgs from a soil boring adjacent to the sediment trap had arsenic concentrations of 3.5 and 3.2. Organochlorine pesticides were not detected in a sample of the liquid inside the sediment trap. Metals were detected at low concentrations in a sample of the sediment trap liquid. The results of this additional sampling confirmed Dames & Moore's conclusion that the operation of the former evaporation bed did not have a significant impact on the environment.

2.2.3. DGS Site Characterization Investigations 2002/2003

ENVIRON conducted a series of site characterization investigations on behalf of DGS in August and September 2002 and in April 2003. The primary focus of these investigations was to determine whether current or past pesticide use at the site had resulted in soil concentrations that might pose a threat to public health and the environment. Initially, over 50 samples of surface soil were collected to determine if surface soil in field plots and the greenhouses contained pesticide residues. These samples were analyzed for chemicals/pesticides that may persist in soil for many years following application. The chemicals analyzed included 14 chemicals of potential concern, known to have been used at the site, and 60 pesticides that were commonly used prior to 1979. In addition, subsurface soil samples were also collected and analyzed from a former sewer leach pit, the former evaporation pond and sediment trap to determine if deeper subsurface soil and potentially ground water beneath the site contained pesticide residues.

2.2.3.1. Surface Soil Results

Surface soil sampling results are discussed in detail in the *Phase II – Site Characterization Report* (ENVIRON, 2003). The results of analyses of soil samples from the field plots and greenhouses at the site indicate that only seven organochlorine pesticides, diquat and thirteen inorganic compounds were detected. Triazine pesticides, organophosphorous pesticides, chlorinated herbicides, paraquat, carbamate pesticides and urea pesticides were not detected in any of the samples analyzed. A statistical summary of the compounds detected is provided in Table 1.

Of the pesticides, 4,4'-DDT, 4-4'DDE and diquat were detected the most frequently at a rate of about 66 percent in the samples analyzed. Dieldrin was detected the next most frequently at a rate of about 25 percent while chlordane and endrin were detected at a frequency of less than 10 percent. Only one detection of heptachlor epoxide was reported in the 59 samples analyzed.

A comparison of the pesticide results with USEPA Region 9 PRGs[1] showed that only dieldrin exceeded the PRG for samples collected at 0.5 feet bgs. Exceedences of the PRGs occurred in one sample from Field 1 and two samples from Field 3. As a result, samples collected at 3 feet bgs from these locations (in addition to 3 more locations in Field 3 and one location in Field 7[2]) were analyzed for organochlorine pesticides. For samples from 3 feet bgs, dieldrin was detected in two of the samples from Field 3 at concentrations below the PRG. Dieldrin was not detected at 3 feet bgs in the other locations analyzed in Field 3 or, in Field 1 and Field 7. 4,4'-DDT and 4-4'-DDE were also detected in samples from Fields 3 and 7 at 3 feet bgs, but at concentrations well below the PRG. Diquat was detected in 8 of the 12 fields at concentrations well below the PRG. A summary of the results is shown on Figure 3.

Although dieldrin exceeded the PRG in three localized areas in shallow soil, the 95% upper confidence level (UCL) of the mean dieldrin concentration in shallow soil for the site was below the PRG of 30 ug/kg (Table 1). With the exception of Field 1, the mean concentration of dieldrin in shallow soil in each individual field is also below the PRG. However, the mean concentration of dieldrin in Field 1, which is where the maximum dieldrin concentration (240 ug/kg) is located, exceeds the PRG. There were three other samples collected from shallow soil in Field 1 and analyzed for dieldrin. Dieldrin was not detected in two of these samples and was detected at 11 ug/kg in the third sample. However, because the dieldrin concentration in the sample collected at F1-C is well above the PRG, the mean dieldrin concentration in Field 1 exceeds the PRG.

For the inorganic compounds, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, cyanide, lead, mercury, nickel, vanadium, and zinc were detected in samples from 0.5 feet bgs. Except for beryllium, cyanide and mercury, these inorganics were detected in all samples. This is expected since these compounds are naturally-occurring constituents of soil. Soil pH was also within the normal range for soil, i.e. between 6 and 8. Table 2 presents a comparison of the inorganic results from surface soil at the site to typical background ranges in soil in California and the western US. This comparison shows that the concentrations of inorganics detected at the site are within the typical background range for California/Western US.

Table 2 also presents background ranges for metals in soil in northern Santa Clara County and in the Bay Area. These background ranges were compiled in a report by Christina

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1 USEPA Region 9 PRGs were used for screening purposes only. The PRGs used for comparison are for residential soil from: October 1, 2002, *USEPA Region 9 Preliminary Remediation Goals (PRGs).*
2 These samples were analyzed because preliminary laboratory showed detection limits above the PRGs.

Scott from various environmental investigations done within a 2-mile radius in northern Santa Clara County (Scott, 1991) and in a report by Lawrence Berkeley National Laboratory (LBNL) in the San Francisco Bay Area (LBNL, 2002). The former BAREC site is located in southern Santa Clara County between 5 and 10 miles south of where samples for northern Santa Clara County were collected in the Scott study. As discussed in Section 2, the site is underlain by Quaternary alluvium deposited by streams that merge near the center of the San Jose Alluvial Plain and flow north toward San Francisco Bay. The alluvium is composed of unconsolidated interbedded gravel, sand silt and clay and becomes progressively finer-grained northward toward the Bay. Based on this information, the alluvium in northern Santa Clara County may be finer-grained than in southern Santa Clara County suggesting that there may be some natural variations in the inorganic composition of soils between southern and northern Santa Clara County. A qualitative comparison between site data and the northern Santa Clara County data indicates that arsenic concentrations at the site are just outside the range of the northern Santa Clara County background values and the average arsenic concentration at the site is higher (11 mg/kg) than the northern Santa Clara County value (2.9 mg/kg). In addition, the average lead concentration at the site (23 mg/kg) is slightly above the northern Santa Clara County value (11.4 mg/kg). Copper and zinc average concentrations at the site are about the same as the northern Santa Clara County value while the average concentrations of beryllium, chromium, nickel and vanadium at the site are below the northern Santa Clara County study values.

With respect to the LBNL study, a qualitative comparison between site data and the roughly 1400 samples analyzed in LBNL study indicates that arsenic concentrations range from 1.8 to 37 mg/kg at the site and up to 42 mg/kg in the LBNL study. The average arsenic concentration at the site is higher (11 mg/kg) than the LBNL average (5.5 mg/kg). With respect to other metals, the average lead concentration at the site (23 mg/kg) is above the LBNL value (7.0 mg/kg). Barium and zinc average concentrations at the site are about the same as the LBNL average values while the average concentrations of beryllium, chromium, copper, nickel, and vanadium at the site are below the LBNL average values.

Table 2 also presents the results of the one background sample, BG-A, collected below pavement at 0.75 bgs at the site. This sample was taken outside of areas at the site known to have pesticide use. Typically, a minimum of 4 samples should be collected, if possible, to determine background concentrations; however, only one small area of the site, which was outside of buildings, was identified where there was no known pesticide/chemical use. Since the area surrounding the site is highly urbanized and previously used as agricultural land, there were also no offsite areas where representative background samples could be collected. As a result, comparison of the results to only one background sample is of limited statistical value. A qualitative comparison indicates that arsenic and lead were detected in many samples at concentrations above the concentrations detected at BG-A. Barium, however, was detected at concentrations below the concentration in BG-A. Except for arsenic, barium and lead, the other metals were detected at similar concentrations as BG-A.

A comparison of the inorganic results with USEPA Region 9 PRGs showed that arsenic exceeded the PRG for all samples including the background sample, BG-A. No other inorganic compound exceeded the PRGs. As noted in the preamble to the PRG table, the PRG for arsenic in residential soils is 0.39 mg/kg. This value is typically below background concentrations in a local area (especially in California), and as such, USEPA Region 9 has at times used the non-cancer PRG for arsenic of 22 mg/kg (USEPA, 2000).

Based on the above, an arsenic background concentration needs to be defined to determine areas at the site, which may have been impacted by arsenical pesticides. A discussion of the rationale for determining an arsenic background is presented below.

2.2.3.1.1. Arsenic Background

As discussed above, in the Scott study, the maximum arsenic concentration in background soil was 20 mg/kg. In the LBNL study, the proposed upper estimate of the background arsenic concentration was 42 mg/kg. In addition, a plot of the cumulative frequency of the shallow arsenic soil concentrations at the site, which is presented in Figure 7 of the *Phase II – Site Characterization Report* (ENVIRON, 2003), shows an inflection point at 20 mg/kg for the site. Based on these data, concentrations of arsenic above 20 mg/kg are considered to exceed background levels.

Furthermore, the arsenic background concentration and removal action objectives that were approved by DTSC for the residential portion of the Town and Country Village Shopping Center (T&CVSC) development at 360 Winchester Boulevard in San Jose, (which is in close proximity to the site), were also considered in determining an arsenic background concentration for the site. The mean background concentration for arsenic at the T&CVSC was 12 mg/kg. The residential removal action objectives for arsenic at the T&CVSC used a site-wide average concentration of 12 mg/kg and a maximum arsenic concentration of 20 mg/kg.

Table 3 presents summary statistics for arsenic in shallow and deeper soil at the site. Assuming the arsenic concentrations that are above 20 mg/kg are replaced with a concentration of 7 mg/kg, which is the average concentration in deep soils, the average, standard deviation and 95% UCL of the mean arsenic concentration in shallow soil becomes of similar magnitude to deeper soil. Furthermore, if the arsenic concentrations above 20 mg/kg are removed and the eastern portion of Field 4 is removed and replaced with soil with arsenic concentrations less than 7 mg/kg, then the average arsenic concentration in shallow soil at the former BAREC site is less than 12 mg/kg, which is the mean background concentration for arsenic that was used at the nearby T&CVSC site.

2.2.3.1.2. Nature and Extent of Arsenic above Natural Background Levels

Figures 4 and 5 illustrate the horizontal and vertical extent of arsenic in soil at the site. Elevated concentrations of arsenic above 20 mg/kg are located primarily in the eastern portion of Field 4, primarily at 0.5 feet bgs, in sample 1-GB collected from distressed vegetation next to the old screen house, and in sample F12-A in the dirt road between Fields 11 and 12 at 0.5 feet bgs. Sample F12-A, which has an arsenic concentration above 20 mg/kg, between Fields 11 and 12, however, appears to be of limited horizontal and vertical extent. Adjacent samples in Field 11 and 12 have arsenic concentrations of 10 and 5.3 mg/kg, respectively, and the sample at 3 feet bgs at F12-A has an arsenic concentration of 7.7 mg/kg. Sample 1-GB was collected from an obviously brown patch of grass in April 2003. The brown patch of grass was less than 2 feet in diameter surrounded by dark green grass.

With respect to the elevated concentrations of arsenic in Field 4, there are several samples in the southern half of Field 4 with arsenic above 20 mg/kg. At 0.5 feet depth, 6 samples exceeded 20 mg/kg at the following locations: F4-6, F4-A, F4-B, F4-C, F4-D, and F4-F; at 2 feet bgs, one sample exceeded 20 mg/kg at F4-7; and, at 3 feet bgs, two samples exceeded 20 mg/kg at the following locations: F4-7 and F4-C. Arsenic concentrations above 20 mg/kg are of limited vertical extent. All samples at 4 feet bgs collected from direct-push borings at F4-E/SB-1, F4-C/SB-2, and F4-F/SB-3 (near F4-7) had arsenic concentrations of 1.8, 7.7, and 2.6 mg/kg.

2.2.3.2. Subsurface Soil Sampling Results

With respect to samples collected from the former sanitary sewer leach pit, VOCs, SVOCs, organochlorine pesticides and TPH were not detected in soil samples collected from the bottom and 3 feet below the former sewer leach pit. Metals were detected at low concentrations in both samples.

With respect to the sampling results from the former evaporation pond, the soil samples, which were collected from depths of 2, 3.5, 6.5 and 7.8 feet bgs had arsenic concentrations of 20, 9.7, 2.8, and 2.9 mg/kg respectively. Soil samples collected at depths of 3.5 and 8.5 feet bgs from a soil boring adjacent to the sediment trap had arsenic concentrations of 3.5 and 3.2. Organochlorine pesticides were not detected in a sample of the liquid inside the sediment trap. Metals were detected at low concentrations in a sample of the sediment trap liquid.

These results show no evidence that subsurface soil and/or ground water had been adversely impacted as a result of operation of the former sewer leach pit, evaporation pond and/or sediment trap. No further investigation of subsurface soil and/or ground water was judged to be warranted based on these sampling results. The subsurface sampling results are detailed in the *Phase II – Site Characterization Report* (ENVIRON, 2003).

2.2.3.3. Comparison to Waste Classification Criteria

A comparison of the pesticide and inorganic results from the site with hazardous waste identification criteria in the California Code of Regulations (CCR) Title 22 Section 66261 showed that the average and 95% UCL concentrations were below the Total Threshold Limit Concentrations (TTLC) and 10 times the Soluble Threshold Limit Concentrations (STLC) for the relevant pesticides and inorganics. For the inorganics, no sample concentrations from the site exceeded the TTLC or 10 times the STLC. For the pesticides, there were only two samples, F3-D and F3-E, that exceeded the TTLC for DDT and DDE, but these samples are in areas where concentrations are below PRGs for pesticides and where arsenic concentrations are less than 20 mg/kg. Based on these results, soil in this area will remain in this location.

3.0 IDENTIFICATION OF REMEDIAL ACTION GOALS, OBJECTIVES, AND SCOPE

The results of the previous investigations have indicated the presence of arsenic in soil at levels above background in portions of the site and dieldrin above PRGs in an isolated location in surface soil. In addition, no sensitive fauna or flora have been identified at the site location and as a result, there are no apparent ecological or ground water risks associated with proposed remediation activities.

The purpose of this section is to identify the type and appropriateness of a remedial action, if warranted, and to identify the goals, objectives, and scope for such action to address the risks posed by arsenic and dieldrin in soil at the site. In addition, regulatory requirements are identified so that the remediation goals can be compared against the relevant regulatory standards.

3.1. CHEMICALS OF POTENTIAL CONCERN

As stated in Section 2, arsenic and dieldrin were the chemicals of potential concern that were found at concentrations above PRGs in surface soils. Only three out of 60 sample had concentrations of dieldrin above its PRG. The dieldrin concentrations were of limited horizontal and vertical extent, and the 95% UCL of the mean diedrin concentration for the entire site was below the PRG of 30 ug/kg. However, the mean dieldrin concentration in Field 1 exceeded the PRG primarily because of an isolated detection of dieldrin at a concentration of 240 ug/kg in surface soil. Two other samples, F3-A and F3-B, detected dieldrin at 42 and 37 ppm, respectively, which is just above the PRG. However, the average concentration of these two samples plus the other four samples from Field 3 are below PRG. As a result, it is recommended that only the "hot spot" of dieldrin in Field 1 be addressed such that the mean concentration in Field 1 will be below the PRG of 30 ug/kg.

Arsenic, a naturally occurring inorganic chemical found in soil as well as in certain pesticides, was detected at concentrations above natural, background levels for Santa Clara in a portion of the site. Figures 4 and 5 illustrate the horizontal and vertical extent of arsenic in soil at the site. Elevated concentrations of arsenic above 20 mg/kg are located primarily in the eastern portion of Field 4, primarily at 0.5 feet bgs, in sample 1-GB collected from distressed vegetation next to the old screen house, and in sample F12-A in the dirt road between Fields 11 and 12 at 0.5 feet bgs.

3.2. REMOVAL ACTION OBJECTIVES

To assist in development and evaluation of remedial alternatives for addressing chemicals of potential concern that have been detected in site soils, remedial action objectives (RAOs) have been developed for the site. The RAOs for the site are as follows:

- Minimize exposure of future site residents to surface soil containing arsenic above the 20 mg/kg level,
- Ensure the mean concentration of dieldrin in an individual field is below 30 ug/kg; and
- Leave the site in a physical condition that is compatible with single-family residential use.

Since it is not feasible to remediate arsenic to levels below natural background, the removal action objectives are based on the natural background concentration range for arsenic in soils in this area of Santa Clara. The proposed cleanup goal of 20 mg/kg is within the acceptable health risk range.

3.3. STATUTORY LIMITS ON REMOVAL ACTION

Sections 25323.1 and 25356.1(h) of the California Health and Safety Code (H&SC) state that a site is exempted from the requirement for a remedial action plan if DTSC approves a non-emergency removal action at a site and the estimated cost of the removal action is less than $1,000,000. The removal action alternatives for the former BAREC site are estimated to cost less than this limit and therefore, this removal action workplan (RAW) has been prepared.

3.4. POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Remedial actions under the CERCLA (as amended by the Superfund Amendments and Reauthorization Act) must comply with the substantive provisions of federal and state Applicable or Relevant and Appropriate requirements (ARARs) [CERCLA Section 121(d)]. Applicable requirements are those federal and state cleanup standards, standards of control and other environmental protection requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. If a requirement is not applicable, it still may be relevant and appropriate. A relevant and appropriate requirement addresses problems or situations that are substantially similar to those encountered at the CERCLA site. Under USEPA ARAR guidance[3], a requirement must be both relevant and appropriate to be an ARAR.

It is not unusual that multiple federal and/or state requirements are initially identified as being relevant, even though the requirements address similar issues or circumstances. USEPA ARAR guidance provides for further screening of the "relevant" requirements to determine which requirements are "appropriate" and hence, an ARAR. "Relevant" requirements would not be considered "appropriate" when:

> *"...another requirement is available that more fully matches the circumstances at the site"*, or

> *"...another requirement is available that has been designed to apply to that specific situation, reflecting an explicit decision about the requirements appropriate to that situation."*

For a state requirement to qualify as an ARAR, it must be promulgated, legally enforceable, more stringent than any corresponding federal requirements, consistently applied, and identified in a timely manner.

ARARs fall into one of three identified categories: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs are health or risk-based numerical limitations or standards that apply to site-specific conditions. Location-specific ARARs are restraints placed on activities conducted in a specific location. Action-specific ARARs are technology- or activity-based requirements or limitations on actions taken with respect to hazardous waste or site remediation activities. Table 4 provides a summary of federal, state and local ARARs and TBCs for the arsenic-contaminated soil at the site.

With respect to chemical-specific ARARs, there are no promulgated State or Federal standards for arsenic-contaminated soil. There are also no location-specific ARARs for arsenic contaminated soil at the site. A potential action-specific ARAR for arsenic-contaminated soil relates to regulations promulgated under the Federal Resource Conservation and Recovery Act (RCRA) and State Hazardous Waste Regulations, which govern characterization, disposal, storage, treatment and transportation of waste.

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3 See CERCLA Compliance with Other Laws Manual: Interim Final, August, 1988.

Compliance with RCRA regulations would apply to the site if arsenic-contaminated soil is excavated and disposed of offsite. Other potential action-specific ARARs are the Clean Air Act and California Ambient Air Standards, which regulate emissions of chemical vapors and dust, and the City of Santa Clara Ordinance related to soil movement or grading. Compliance with these regulations would apply if soil were excavated. Other action-specific standards are the Federal and State Occupational Safety and Health Administration Regulations (OSHA), which establish standards for workers.

In addition to chemical-, location-, and action-specific ARARs, advisories, criteria, and guidance developed by USEPA or other federal or state agencies may, as appropriate, be considered in developing the CERCLA remedy. These criteria are referred to as "to-be-considered" (TBC) criteria.

With respect to TBCs, the USEPA has developed Risk Assessment Guidance for contaminated sites (Risk Assessment Guidance for Superfund, 1989) and Soil Screening Guidance (Soil Screening Guidance: Technical Background Document, EPA/540/R-95/128, July 1996) as a tool to evaluate and cleanup sites on the National Priorities List. These guidances provide methodology for developing risk-based, site-specific screening levels (SSLs) for contaminants in soil. For example, the SSL presented in the guidance for arsenic is 0.4 mg/kg for residential land use. According to USEPA, SSLs are not cleanup levels and on their own do not trigger the need for a response action. If chemicals equal or exceed their SSL, further study or investigation, but not necessarily clean up, is warranted.

Similar to the SSLs, USEPA Region 9 has developed Preliminary Remediation Goals (PRGs) as risk-based tools for evaluating cleanup of contaminated sites. As previously stated in Section 2, the PRG for arsenic is 0.39 mg/kg and 30 ug/kg for dieldrin for a residential site. For arsenic, this value is typically below background concentrations in a local area (especially in California), and as such, USEPA Region 9 has at times used the non-cancer PRG for arsenic of 22 mg/kg (USEPA, 2000). Further evaluation may include additional sampling, considering background or ambient levels, and re-evaluating exposure and toxicity assumptions.

These guidances are considered TBCs, which are non-promulgated advisories or guidances that are generally not enforceable. Where no specific potential ARARs exist for a chemical or situation, or where such potential ARARs are not sufficient to be protective, guidance documents or advisories may be considered in determining the necessary level of cleanup for the protection of human health or the environment.

There are no chemical-specific ARARs for arsenic and dieldrin in soil. As previously stated, PRGs, which are considered TBCs, exist for arsenic and dieldrin. For dieldrin, the threshold cleanup level at the site for unrestricted residential land use is the PRG of 30 ug/kg. For arsenic, since TBCs do not consider relatively high naturally occurring background levels in California soil, remedial actions and alternatives are evaluated considering the estimated background concentration range for arsenic. A discussion of arsenic background concentrations was presented in Section 2.2.3.1. The cleanup levels for arsenic and dieldrin for unrestricted residential land use at the site are as follows:

- The maximum concentration of arsenic may not exceed 20 mg/kg;
- The average concentration of arsenic in soil shall not exceed 12 mg/kg; and,
- The mean concentration of dieldrin in each individual field shall not exceed 30 ug/kg.

The cleanup levels for arsenic are the same as the residential removal action objectives for arsenic for unrestricted land use at the T&CVSC development at 360 Winchester Boulevard. Although these cleanup goals are protective of health, additional precaution may be employed to further reduce any potential exposure to contaminated soil. Based on these factors, the TBCs for the site and subsequent evaluation of remedial alternatives will focus, not only on numerical cleanup standards for soils but also on different strategies for preventing exposure to contaminated soil.

4.0 IDENTIFICATION AND EVALUATION OF REMOVAL ACTION ALTERNATIVES

The remedial alternative evaluation, as presented below, consists of development of three remedial alternatives, evaluation of the alternatives against NCP and USEPA guidelines, and the selection of an appropriate remedial alternative for the site.

4.1. REMOVAL ACTION ALTERNATIVES

The response actions for soil at the site include excavation and off-site disposal, capping, and institutional controls. These response actions have been assembled into candidate remedial alternatives for the site.

The three alternatives that have been developed for the site are:

Alternative 1 No Action

Alternative 2 Capping and Institutional Controls;

Alternative 3 Excavation with Off-Site Disposal;

A description and details regarding implementation of each alternative are presented below.

4.1.1. Alternative 1 – No Action

Alternative 1 is the No Action Alternative. In this alternative, it is assumed that no removal action occurs. This alternative also forms the basis of comparison for all other alternatives. If no action were taken at the site, maintenance of a fence and land use restrictions would be required.

4.1.2. Alternative 2 – Capping and Implementation of Institutional Controls

Alternative 2 consists of placing a soil cap over the eastern portion of Field 4, excavating the three small hot spots at F1-C, 1-GB and F12-A, and establishing institutional controls for the site. Figure 6 shows the excavation and capping areas. The two hots spots at 1-GB and F-12A would be excavated until confirmation samples collected from the excavation perimeter showed arsenic concentrations below 20 mg/kg. For the hot spot at F1-C, soil would be excavated until the mean concentration of dieldrin in Field 1 was less than 30 ug/kg. It is estimated up to a total of 500 cubic yards would be excavated from these three hot spots. Excavated soil would be transported offsite for disposal or re-use. Analytical data collected to date indicates that excavated soil from the site will likely be nonhazardous. Additional waste characterization samples will be collected from the excavated soils prior to offsite disposal as part of implementation of Alternative 2. Assuming these samples confirm that the soil is indeed nonhazardous, then the soil will be transported offsite to a municipal landfill for disposal.[4]

With regards to capping, a minimum thickness of 24 inches of soil will be placed over the eastern portion of Field 4 to prevent direct contact with native soil that has arsenic concentrations greater than 20 mg/kg. Appropriate compaction of capped soil would be conducted. Drainage netting would be placed underneath the capping. After completion of the capping, the drainage netting would serve as a “marker” for assistance in maintaining adequate cover over the potentially arsenic-impacted soil. If netting were observed in the future, either during excavation activities or as a result of erosion, remedial activities or placement of additional soil would be implemented to prevent exposure to the soils below the “marker” netting.

Institutional controls would be placed to reduce or eliminate exposure to potentially arsenic-impacted soils at the site. Institutional controls would consist of development and implementation of a site management plan and deed restrictions. The site management plan would, at minimum, outline the procedures for inspection and maintenance of the site to ensure that ground covering such as pavement, grass, landscaping or mulch is maintained in all soil areas; risk management measures to be implemented during subsurface work; limitations on residents activities that potentially disturb the landscape cover over the site; and, actions to be taken were the site redeveloped. The deed restrictions would prevent development of single-family homes, schools, day care facilities, etc. over the capped area of the site. All institutional controls would require approval by the City of Santa Clara Department of Environmental Health (DEH) and DTSC. Annual inspections would be performed to ensure compliance with the site management plan and deed restrictions.

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[4] It is possible that the soil could be re-used by the California Department of Transportation (CalTrans) in a future, nearby roadway project depending on the timing of implementation of the removal action and the roadway project. If a CalTrans project were identified, specific approval would need to be obtained from DTSC and as such, DTSC would be contacted.

4.1.3. Alternative 3 – Excavation with Off-Site Disposal

Alternative 3 consists of excavating and removal of soil from the three hot spots and from the eastern half of Field 4. Soil would be excavated from 1-GB, F12-A and the eastern half of Field 4 until arsenic concentrations are below the cleanup goals (i.e., below 20 mg/kg and site average of 12 mg/kg). For the hot spot at F1-C, soil would be excavated until the mean concentration of dieldrin in Field 1 was less than 30 ug/kg. All excavated soil would be disposed of offsite. Figure 7 shows the estimated extent of the excavation areas under Alternative 3. It is estimated that up to 6000 cubic yards of soil would be excavated and disposed of offsite. During excavation, appropriate dust suppression would be applied at all times to ensure atmospheric dust levels would not exceed the acceptable levels. Dust levels would be monitored during implementation of this alternative.

After excavation, samples of soil at the edges and base of each excavation would be collected and analyzed for chemicals of potential concern to demonstrate that in-place concentrations are below the cleanup goals. If needed, additional soil excavation and confirmatory sampling would continue until in-place concentrations are below the remedial goals. The excavations would be backfilled with clean soil imported from off-site and appropriate compaction of backfilled soil would be conducted.

As with Alternative 2, excavated soil would be transported offsite for disposal[5]. It is anticipated that excavated soil will be nonhazardous, and as such, it is assumed for cost estimating purposes that the excavated soil will be transported to and disposed of at a municipal landfill.

4.2. EVALUATION CRITERIA

The three alternatives described above are subjected to detailed evaluation in Section 4.3. Each alternative is evaluated on the basis of three criteria: effectiveness, implementability and cost.

4.2.1. Effectiveness

In the effectiveness evaluation, the following factors are considered:

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[5] It is possible that the soil could be re-used by the California Department of Transportation (CalTrans) in a future, nearby roadway project depending on the timing of implementation of the removal action and the roadway project. If a CalTrans project were identified, specific approval would need to be obtained from DTSC and as such, DTSC would be contacted.

- *Overall Protection of Human Health and the Environment*. For the site, this factor considers the ability of each alternative to meet RAO's. As discussed in Section 3.3, the RAO's for the site are: 1) minimize exposure of future site residents to surface soil containing arsenic above the 20 mg/kg level, 2) ensure the mean concentration of dieldrin in an individual field is below 30 ug/kg; and 3) leave the site in a physical condition that is compatible with single-family residential use;

- *Compliance with ARARs/TBCs.* As discussed in Section 3.5, the cleanup goals for soil at the site are: 1) the mean concentration of dieldrin in an individual field is below 30 ug/kg; 2) the maximum concentration of arsenic may not exceed 20 mg/kg; and 3) the average concentration of arsenic in shallow soil shall not exceed 12 mg/kg;

- *Reduction of Mobility, Toxicity, or Volume.* For the site, this factor evaluates whether the mobility and/or volume of arsenic[6] in soil is reduced as a result of implementation of the alternative. A reduction in toxicity of arsenic/dieldrin is not considered since none of the removal action alternatives consider treatment of arsenic/dieldrin-impacted soil;

- *Long-Term Effectiveness and Permanence.* For the site, this factor considers whether the RAOs and cleanup goals will continue to be met in the future under each alternative; and

- *Short-Term Effectiveness.* This factor evaluates the protection of public health during implementation of each alternative for the site.

4.2.2. Implementability

This criterion examines the technical and administrative feasibility of implementing the alternative. Evaluation includes the availability of various services and materials required during implementation of the action, institutional or social concerns that could preclude the action, and State concerns that could impact implementation. In the implementability evaluation, the following factors are considered:

[6] Reduction in mobility or volume of dieldrin is not considered under this criterion because the volume of dieldrin-impacted soil is small relative to the volume of arsenic-impacted soil.

- Technical feasibility: the ease or difficulty of implementing the alternatives and the reliability of the technology.
- Administrative feasibility: those activities needed to coordinate with other offices and agencies, such as waivers or permits.
- State Acceptance; and
- Community Acceptance.

4.2.3. Cost

This criterion evaluates the estimated capital cost, and, if appropriate, the estimated operation and maintenance (O&M) costs assuming a 7% interest rate.

4.3. ALTERNATIVES EVALUATION

This section presents the detailed evaluation of the three alternatives.

4.3.1. Alternative 1 – No Action

Effectiveness

Because no removal action would be implemented as part of Alternative 1, RAOs and cleanup goals would not be met, arsenic mobility and volume would not be reduced, and therefore, this alternative would not be effective at protecting human health in the short- or long-term.

Implementability

Since there is no action under this alternative, the technical and administrative feasibility of this alternative is easy. However, state and community acceptance of this alternative is unlikely.

Cost

There are no costs associated with implementation of this alternative.

4.3.2. Alternative 2 – Capping and Implementation of Institutional Controls

Effectiveness

Through capping and hot spot excavation, Alternative 2 minimizes exposure of future site residents to arsenic above 20 mg/kg and leaves the site in a physical condition that is compatible with single-family residential use. However, Alternative 2 does leave arsenic in soil in Field 4 above 20 mg/kg and does not lower the site-wide average arsenic concentration to below 12 mg/kg, and as such, Alternative 2 does not comply with cleanup goals. Alternative 2 does reduce the mobility of arsenic/dieldrin at the site as a result of capping and excavation, and the volume of arsenic/dieldrin at the site is reduced somewhat as a result of the hot spot excavation. The long-term effectiveness of Alternative 2 is uncertain because it is dependent on the ability of the cap to be maintained through implementation of a site management plan and enforcement of deed restrictions over the capped area. Since implementation of Alternative 2 involves only excavation of roughly 500 cubic yards of soil with elevated arsenic/dieldrin and the time to implement Alternative 2 is only a few weeks, exposure of construction workers and nearby residents to contaminants during implementation of Alternative 2 is minimal. As a result, the short-term effectiveness of Alternative 2 is acceptable.

Implementability

The techniques used to excavate and cap the impacted soil are well-established and the equipment, materials, and labor are readily available. There would be no technical restrictions to implementation.

Permits would be required for excavation and grading, and deed restrictions (i.e. institutional controls) would also be required, but there are no known administrative restraints to the implementation of this alternative. However, there may be difficulties in enforcing the site management plan and deed restrictions for development over the capped area. As a result, community and state acceptance of this alternative is uncertain.

Cost

An estimate of the costs of implementing Alternative 2 is presented in Table 5. The estimated capital cost to implement Alternative 2 is $ 406,000. The O&M costs associated with this alternative include maintenance of the cap. It is assumed that O&M of the cap would be the responsibility of a property owner's association in the capped area. Annual O&M costs are estimated to be $7,000. The present value of O&M costs over a 30-year period assuming a 7% interest rate is $ 74,500. The total estimated cost for Alternative 2 is, therefore, estimated to be $480,500.

4.3.3. Alternative 3 – Excavation with Offsite Disposal

Effectiveness

Through excavation, Alternative 3 minimizes exposure of future site residents to arsenic above 20 mg/kg and leaves the site in a physical condition that is compatible with single-family residential use. Alternative 3 removes arsenic in soil in Field 4 above 20 mg/kg and lowers the site-wide average arsenic concentration to below 12 mg/kg, and as such, Alternative 3 complies with cleanup goals. Alternative 3 also reduces the mobility and volume of arsenic/dieldrin at the site as a result of excavation and offsite disposal. The long-term effectiveness of Alternative 3 is acceptable because soil with chemicals of potential concern above the cleanup goals will be removed from the site. Since implementation of Alternative 3 involves excavation of roughly 6000 cubic yards of soil, exposure of construction workers and nearby residents to contaminants during implementation of Alternative 3 may occur. However, the time to implement Alternative 3 is only a few weeks and dust control measures would be implemented during excavation activities, thus minimizing nearby residents overall exposure to site contaminants. As a result, the short-term effectiveness of Alternative 3 is acceptable.

Implementability

The techniques used to excavate the impacted soil are well-established and the equipment, materials, and labor are readily available. There would be no technical restrictions to implementation.

Permits would be required for excavation and grading, but there are no known administrative restraints to the implementation of this alternative. Alternative 3 should be acceptable to the community and state.

Cost

An estimate of the costs of implementing Alternative 3 is presented in Table 6. The estimated capital cost to implement Alternative 3 is $874,000.

4.4. COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

The three remedial alternatives described above are subjected to comparative evaluation below. As part of the comparative analysis, each alternative is also rated relative to each other. Rating points are then assigned based on each alternative's ability to meet the evaluation criteria. Table 7 summarizes the results of the comparative analysis.

4.4.1. Effectiveness

Alternative 1 - No Action: This alternative, rated the lowest in effectiveness, is presented as a baseline case. No points are assigned under this criterion because Alternative 1 does not satisfy any of the five factors under the effectiveness criterion.

Alternative 2 – Capping and Implementation of Institutional Controls: Alternative 2 is rated higher in effectiveness than Alternative 1, but not as effective as Alternative 3. Alternative 2 addresses RAOs, but does not meet site cleanup goals. Alternative 2 reduces the mobility and volume of arsenic/dieldrin in site soils through capping and limited excavation, but does not reduce the mobility or volume nearly to the extent as Alternative 3. Because of the uncertainty regarding future maintenance of the cap, the long-term effectiveness and permanence of Alternative 2 is uncertain. The short-term effectiveness of Alternative 2, however, is acceptable. Alternative 2 was assigned a total of 2.5 points under the effectiveness criterion.

Alternative 3 - Excavation with Offsite Disposal: Alternative 3 is rated higher in effectiveness than Alternative 1 or Alternative 2. Alternative 3 addresses RAOs and will meet cleanup goals through excavation and offsite disposal. Alternative 3 also reduces the mobility and volume of arsenic/dieldrin in soil in comparison to the other two alternatives. Alternative 3 is a permanent solution so there are no risks of human exposure to elevated concentrations of chemicals of potential concern in soil in the future. As with Alternative 2, the short-term effectiveness of Alternative 3 is acceptable. Alternative 3 is assigned 5 points because it satisfies all of the sub-criteria under effectiveness.

4.4.2. Implementability

With exception of Alternative 2, there are no technical feasibility concerns with the implementation of the alternatives. A site management plan and deed restrictions, which would be prepared as part of Alternative 2, would require approval from the regulatory agencies and long-term enforcement of the site management plan and deed restrictions is uncertain. The technical/administrative feasibility of Alternatives 1 and 3 is easier than Alternative 2.

Alternatives 2 and 3 involve excavation, which can easily be conducted at the site. Alternatives 2 and 3 involve importing materials, which are readily available in the site vicinity. Alternatives 2 and 3 are also easy to construct, and the goods and service are easily available.

Because of uncertainties regarding long-term enforcement of institutional controls, Alternative 2 may have difficulty with regards to state and community acceptance. However, Alternative 1, which does nothing to prevent/minimize contact with arsenic/dieldrin impacted soil, is the least likely alternative to be accepted by the state and community. Alternative 3 is likely the most acceptable alternative to the state and community.

4.4.3. Cost

In Table 7, 5 points are assigned if the cost is less than $100,000 to implement the alternative; three points are assigned if the cost to implement the alternative is between $100,000 and $500,000; one point is assigned if the cost to implement the alternative is between $500,000 and $1,000,000; and, no points are assigned if the cost to implement the alternative exceeds $1,000,000.

There are no costs associated with Alternative 1 since no action is proposed. Alternative 2 is less expensive than Alternative 3 and less than $500,000. Alternative 3 was the most expensive at roughly $800,000.

4.4.4. Rating Summary

As shown in Table 7, the sum of the ratings, shows that Alternative 3, Excavation with Offsite Disposal, as the highest rated alternative. Although the most expensive alternative, Alternative 3 is the most protective of human health, removes all contamination above cleanup goals and is relatively easy to implement. As a result, Alternative 3 is the recommended alternative for the former BAREC site.

5.0 REMOVAL ACTION IMPLEMENTATION

This Section details the steps that will be taken to implement Alternative 3 at the former BAREC site. Removal activities will be performed by a California certified contractor (the "Contractor") including supervision by a California registered geologist or professional civil engineer (the "Engineer"). All removal, transportation and disposal will be performed in accordance with all applicable federal, state, and local laws, regulations, and ordinances.

5.1. SITE PREPARATION

Prior to equipment mobilization for the proposed removal action, the preparation activities detailed in the following sections will be implemented.

5.1.1. Building Demolition

Prior to implementation of RAW activities, the site buildings/structures and their foundations that are not planned for reuse will be demolished. Demolition activities will be conducted in accordance with all applicable regulations especially regulations pertaining to the handling, management and disposal of asbestos containing materials and lead-based paint. All building debris, which is not to be reused during future re-development, will be removed from the site. The irrigation well located at Building 203 will be closed and abandoned according to the Santa Clara Valley Water District requirements prior to site redevelopment.

A minimum of one sample shall be collected from soil up to 6 inches beneath each of the building foundations following building/foundation removal. No samples will be collected from the greenhouses, which were already sampled in prior environmental investigations. Samples will be analyzed for asbestos, lead, arsenic, organochlorine pesticides and petroleum hydrocarbons. Additional samples may be collected and additional analyses performed if the Engineer observes evidence of possible releases of contaminants to soils beneath the former building/structure.

5.1.2. Site Stripping

Following building demolition, the site will be stripped of all vegetation and loose soils in preparation for redevelopment. It is important that prior to stripping/rough grading, the locations of Field 4, the hot spots at F1-C, 1-GB and F12-A be marked and their coordinates recorded.

5.1.3. Utility Clearance

No invasive activities will begin without notification of local "Underground Services Alert (USA)" and identification of utilities in and around the excavation area at least 48 hours prior to beginning of work. In addition, a private utility locator will be retained to conduct a utility survey prior to beginning of the excavation, to ensure that all underground utilities in the proposed work areas have been identified.

5.1.4. Delineation of Excavation Areas

Following stripping/rough grading, the locations of the hot spots (F1-C, 1-GB, and F12-A) and excavation area in Field 4 will be marked. An excavation grid will be established at Field 4 to facilitate pre-and post excavation sampling. At Field 4, the grid will be 50 feet by 50 feet. The boundary of the excavation area will be the north, south, and eastern boundaries of Field 4 and the western extent of the excavation will extend 250 feet west of the eastern boundary of Field 4. At the hot spots, the excavation boundary will extend from the hot spot to 5 feet in all directions.

5.1.5. Security Measures

Appropriate barriers and/or privacy fencing will be installed prior to beginning the excavation process to ensure that all work areas are secure and safe. To ensure trespassers or unauthorized personnel are not allowed near work areas, security measures may include, but are not limited to:

- Posting notices directing visitors to the Site Manager and limiting access to work areas. The Site Manager will be the person in charge of supervising all activities at the site.

- Maintaining a visitor and personnel's log. Visitors must have prior approval from the Site Manager to enter the site. Visitors shall not be permitted to enter the site without first receiving site-specific health and safety training from the Site Health and Safety Officer(s). The Site Health and Safety Officer(s) will be in charge of ensuring compliance with the health and safety plan (HASP), and of providing a point of contact for employees working at the site who have questions regarding the HASP.

- Installing chain-link barrier fencing around the perimeter of the work area, which will be locked during non-work hours to restrict access to the excavation and nearby areas.

- Requiring that all personnel, before leaving the site, sign out in the visitor and personnel's log.

- Maintaining a safe and secure work area, including areas where equipment is stored or placed, at the close of each workday.

Persons requesting site access will be required to demonstrate a valid purpose for access and provide appropriate documentation to demonstrate they have received proper training required by the site-specific HASP (discussed below).

5.1.6. Permits

It is anticipated that a grading permit from the City of Santa Clara will be necessary to complete the removal action.

5.1.7. Waste Management

Based on the results of prior site investigations, it is anticipated that soil excavated from the site will be nonhazardous. Analytical results were compared to the California hazardous waste identification criteria in the California Code of Regulations (CCR) Title 22 § 66261. These results indicate that the waste is classified as a nonhazardous waste and could be disposed of at local municipal landfill.

5.1.8. Bay Area Air Quality Management District (BAAQMD)

Potentially applicable BAAQMD regulations include those addressing particulate matter emissions (Regulation 6). BAAQMD Regulation 6 addresses particulate matter and visible emissions mostly pertaining to discrete point sources. However, Regulation 6-305 states:

> **"Visible Particles:** A person shall not emit particles from any operation in sufficient number to cause annoyance to any other person, which particles are large enough to be visible as individual particles at the emission point or of such size and nature as to be visible individually as incandescent particles. This Section 6-305 shall only apply if such particles fall on real property other than that of the person responsible for the emission."

The air monitoring network described below and the dust control measures will be implemented such that the project remains in compliance with this regulation.

5.1.9. Health And Safety Plan (HASP)

All contractors will be responsible for operating in accordance with the most current Occupational Safety and Health Administration (OSHA) regulations including 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, and 29 CFR 1926, Construction Industry Standards, as well as other applicable federal, state and local laws and regulations. A HASP will be prepared and submitted to DTSC prior to implementation of the RAW.

5.1.10. Soil Sampling and Analysis Plan

Appendix B contains soil sampling and quality assurance guidelines for the sampling that is to be performed following building demolition, site stripping and excavation activities.

5.2. FIELD DOCUMENTATION

The Engineer will be responsible for maintaining a field logbook during the removal action activities. The field logbook will serve to document observations, personnel on-site, equipment arrival and departure times, and other vital project information.

5.2.1. Field Logbooks

Field logbooks will document where, when, how, and from whom any vital project information was obtained. Logbook entries will be complete and accurate enough to permit reconstruction of field activities. Logbooks will be bound with consecutively numbered pages. Each page will be dated and the time of entry noted in military time. All entries will be legible, written in black ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions or other terminology, which might prove inappropriate. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Corrections will be dated and initialed. No entries will be obliterated or rendered unreadable.

Entries in the field logbook will include at a minimum the following for each fieldwork date:

- Site name and address
- Recorder’s name

- Team members and their responsibilities
- Time of site arrival/entry on-site and time of site departure
- Other personnel on-site
- A summary of any on-site meetings
- Field observations of soil (e.g., heavy rains, odors, colors, etc.)
- Quantity of soil excavated
- Quantity of soil temporarily stored on-site
- Quantity of excavated soil in truckloads transported off-site
- Names of waste transporters and proposed disposal facilities
- Copies or numbers of manifests or other shipping documents (such as bill of landing) for waste shipments
- Quantity of import fill material in truckloads
- Deviations from this RAW and/or HASP
- Changes in personnel and responsibilities as well as reasons for the changes
- Levels of safety protection
- Calibration readings for any equipment used and equipment model and serial number

5.2.2. Photographs

Photographs will be taken at every excavation area, and in other areas of interest on-site. Photographs will also be taken prior to the commencement of site re-development and construction activities. They will serve to verify information entered in the field logbook. When a photograph is taken, the following information will be written in the logbook or will be recorded in a separate field photography log:

- Time, date, location, and, if appropriate, weather conditions
- Description of the subject photographed

- Name of person taking the photograph

5.3. EXCAVATION

5.3.1. Excavation Plan

The estimated extent of the excavation area is shown in Figure 7 (although the actual lateral extent of removal would be determined based on sample results during implementation of the alternative). The estimated volume of soil to be excavated is approximately 6000 cubic yards. Depending on weight of the soil, between 300 and 350 truckloads of soil will be transported offsite over roughly a 2-week period. The excavation will be conducted in phases.

Field 4 Excavation

For Field 4, the excavation will be conducted in one-foot lifts. Prior to excavating each one-foot lift, samples of surface soil will be collected in each of the grid nodes and analyzed for arsenic on a 24-hour turnaround time (TAT). Samples will be collected prior to excavation because stripping the site may result in as much as 8 inches of soil being removed from portions of the site. The samples collected during DGS site characterization activities were from approximately 6 inches bgs. Since samples at 3 feet bgs were above the cleanup goals except at F4-7 and F4-C, re-sampling is necessary to determine if arsenic concentrations after stripping remain above the cleanup goals. The excavation area will be determined based on the results of the samples. The Engineer will delineate the grid areas that require excavation to a one-foot depth considering the cleanup goals for the site, i.e. no arsenic concentrations above 20 mg/kg and a site-wide arsenic concentration of 12 mg/kg. Soil in the delineated areas will be excavated to a one-foot depth and then samples collected from the grid nodes in the delineated areas to determine if the cleanup goals have been met. The excavation will continue in one-foot depth increments until the Engineer determines the cleanup goals have been met or specific site conditions require the Engineer to revise the excavation plan or sampling sequence. Confirmation samples will be collected at the grid nodes at the base of the excavation, i.e., approximately every fifty feet.

Hot Spot Excavation

After stripping and prior to excavation, a sample will be collected from each of the three hot spots. Samples will be collected prior to excavation because stripping the site may result in as much as 8 inches of soil being removed from portions of the site. The hot spot samples collected during DGS site characterization activities were from approximately 6 inches bgs. Since samples at 3 feet bgs at the hot spots were below the cleanup goals, re-sampling will be performed to confirm that arsenic/dieldrin concentrations after stripping remain below the cleanup goals.

The sample from hot spot F1-C will be analyzed for dieldrin, and the hot spots from 1-GB and F12-A will be analyzed for arsenic. Excavation activities will be initiated at F1-C if the dieldrin concentration is greater than 30 ug/kg, and at 1-GB and F12-A if the arsenic concentration is greater than 20 mg/kg. If excavation is required, a five-foot radius around the hot spot will be excavated to a depth of two feet. A sample will be collected and analyzed for arsenic (at 1-GB or F12-A) or dieldrin (at F1-C) from the bottom of each excavated area. If the results indicate that arsenic is less than 20 mg/kg at 1-GB or F12-A or that dieldrin is less than 30 ug/kg at F1-C, the excavation will cease and be prepared for backfilling. For 1-GB and F12-A, if the results indicate that arsenic exceeds 20 mg/kg, the excavation will continue at one-foot depth increments and five-foot step-outs until the arsenic concentration is less than 20 mg/kg. For F1-A, if the results indicate that dieldrin exceeds 30 ug/kg, the excavation will continue at one-foot depth increments and five- foot step-outs until the mean dieldrin concentration in Field 1 is less than 30 ug/kg. Additional bottom samples shall be collected once the excavation area exceeds 2500 square feet.

Properly equipped workers, required to be trained according to 29 CFR 1910.120, will complete all fieldwork. Soil containing elevated concentrations of arsenic will be excavated using a hydraulic backhoe or other types of earth moving equipment, as necessary. Excavation areas will be controlled to avoid dust generation with physical barriers (such as perimeter fencing with tarps) and wetting. The site will be controlled and no excavation will be conducted in times of high wind conditions. Storm water drains will be covered with plastic sheeting during all excavation activities, to prevent sediment or excavation runoff from entering the drains.

5.3.2. Temporary Storage Operations

As soil is excavated, it may be temporarily stored at staging areas on-site before off-site transportation and disposal. At the staging areas, excavated soil will be placed on an impermeable barrier and covered with tarps to prevent any run-on and/or dust generation, and bermed to contain any run-off. Stockpiles shall be no higher than 6 feet. Each excavation area will be secured and water will be used to control any fugitive dust from blowing onto other properties.

Direct loading may take place concurrently with excavation operations, in which case, stockpiles may be uncovered while loading. To minimize fugitive dust emissions during loading, drop heights should be minimized and water should be used. It is anticipated that soil to be disposed of offsite will be temporarily stockpiled at Field 1 (excavation from dieldrin hot spot), Fields 8, 9, 10 and 11. Soil that is to be used for backfilling the excavation (i.e., import soil) will be temporarily stockpiled on Field 2. Stockpiles of soil, either import soil or soil to be exported, shall remain no longer than 30 days.

5.3.3. Decontamination Procedures

Entry to the excavation areas should be limited to avoid unnecessary exposure and related transfer of arsenic-impacted soil. In unavoidable circumstances, equipment or trucks should be decontaminated in a designated decontamination area before leaving the site. Decontamination will occur prior to and after the removal activity has been completed using dry brush, hand washing, or steam cleaning methods. Equipment will be decontaminated in a pre-designated area on pallets or plastic sheeting. Clean bulky equipment will be stored on plastic sheeting. Cleaned small equipment will be stored in plastic bags.

5.4. AIR AND METEOROLOGICAL MONITORING

This section details the air and meteorological monitoring strategy and methodologies that will be used during the removal action. The strategy and methodologies are designed to achieve several goals:

- Measure the particulate matter generated during the excavation and decontamination activities to assign the appropriate personal protective equipment (PPE) for on-site workers;
- Measure particulate matter and meteorological variables to assist the Contractor for the implementation of dust control measures;
- Measure particulate matter to determine potential off-site impacts during excavation and decontamination activities.

Air and meteorological monitoring will be conducted during excavation activities. The monitoring network will consist of two separate networks to monitor for dust or particulate matter with an aerodynamic diameter less than 10 micrometers (PM_{10}). One network will consist of real time dust monitors to be used by on-site health and safety personnel and the Contractor. The second network will consist of real-time PM_{10} monitors to be used for fenceline measurements.

5.4.1. On-site Monitoring Network

Monitor locations for the on-site dust monitors will be based on the on-site health and safety officer's and the Contractor's needs. The locations will be representative of worker exposure and general site conditions. This dust monitoring network will consist of monitors such as the Personal DataRam or PDM-3 Miniram particulate monitor manufactured by MIE, or equivalent. Implementation of PPE will be based on the interpretation of the collected data in comparison to action levels established by the on-site health and safety officer.

5.4.2. Regulatory Standards and Recommended Action Levels

In Section 5.1.8, potentially applicable BAAQMD regulations included those addressing particulate matter emissions (Regulation 6). The fenceline air monitoring network described below and the dust control measures will be implemented to help insure that the project remains in compliance with this regulation.

Federal and state air regulations limit the concentration of PM_{10} in the ambient air through the National Ambient Air Quality Standards (NAAQS) and the California Ambient Air Quality Standards (California AAQS). The NAAQS specify that the concentration of PM_{10} must not exceed 150 $\mu g/m^3$ for a 24-hour period and an annual arithmetic mean of 50 $\mu g/m^3$. California AAQS specify that the concentration of PM_{10} must not exceed 50 $\mu g/m^3$ for a 24-hour period and an annual arithmetic mean of 20 $\mu g/m^3$. The more stringent state limits were used to determine the Recommended Action Level (RAL) for this monitoring program for shorter averaging periods, which are more relevant to the removal activities. Action levels for eight hour averaging periods were developed using averaging time conversion factors of 1.75.[7] The RAL for PM_{10} for this air-monitoring program is an eight-hour average concentration of 87.5 $\mu g/m^3$.

5.4.3. Fenceline Monitoring Network

Monitor locations for the fenceline PM_{10} monitors will consist of one location, upwind of the site based on the primary wind direction, and multiple locations along the fenceline in

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7 United States Environmental Protection Agency (USEPA). 1992. *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised.* EPA-454/R-92-019. October.

the direction of sensitive off-site locations. The monitors will be real-time PM_{10} monitors. The on-site meteorological station will be located in an area representative of wind patterns for the site, as described in published guidance.[8, 9] On-site meteorological data collected will include wind speed and direction, temperature, and relative humidity. During excavation, fenceline monitoring and meteorological data will be collected on a hourly basis. If during excavation PM_{10} levels exceed 50 ug/m^3 between upwind and downwind monitors, then additional dust control measures will be implemented.

5.5. DUST CONTROL PLAN

This section details potential dust control measures that the Contractor will implement, if required, to minimize dust emissions during the removal action. Dust emissions may result from activities during removal action and from wind erosion. These sources are most effectively controlled using wet suppression. A high wind threshold will also be established to minimize wind erosion during extreme meteorological conditions and low visibility/permeability wind fencing will be installed around the excavation area(s). Stockpiles will be covered unless being loaded, water will be sprayed on areas which have already been excavated and are subject to wind erosion.

5.5.1. Wet Suppression

The main mechanism for the control of fugitive dust emissions from construction activities and wind erosion is by watering, which leads to the formation of a surface crust to reduce the available reservoir of dust. In addition to water, a wide variety of chemical dust suppressants are available to enhance the formation of a surface crust.

The effectiveness of wet suppression is dependent on the type of activities occurring, the frequency of watering, and the meteorological conditions. The watering schedule will be determined by an evaluation of the air monitoring and meteorological data, site conditions, and site activities.

5.5.2. High Wind Warnings

High wind conditions can lead to higher dust emissions. Thus, based on the information collected by the on-site meteorological station, work will be stopped during high wind

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8 Bay Area Air Quality Management District (BAAQMD). 1996. "Meteorological Monitoring Guidance." *Manual of Procedures*. Volume IV. Appendix A. May 8.
9 United States Environmental Protection Agency (USEPA). 2000. *Meteorological Monitoring Guidance for Regulatory Modeling Applications.* EPA-454/R-99-005. February.

conditions. There are no wind speed restrictions stated in local or federal regulations. However, an initial self imposed action level for work stoppage will be set at a sustained wind speed of 25 mph. This action level is subject to revision based on actual site conditions.

5.5.3. Wind Fences

Wind fences will be used as a dust control measure in conjunction with other dust control measures discussed above. The fence reduces the wind speed at a specific location. The fence dimensions necessary to achieve optimum effectiveness will vary depending on the geography of the dust source. Typically, a fence material with 50% porosity is generally considered optimum for most applications. Low visibility/permeability windscreens will be installed around the perimeters of the excavation area(s) during the removal activities.

5.6. TRANSPORTATION PLAN FOR OFF-SITE DISPOSAL

The waste material will be profiled and approval will be received before any excavation activities commence. Final determination of the disposal site will be based on approval from the disposal site. Once the disposal facility is selected, copies of waste profile reports used to secure disposal permission from the landfill will be provided to DTSC. A Transportation Plan is included in Appendix A.

5.7. SITE RESTORATION

Clean import fill will be brought to the site to backfill all excavated areas. The imported soil be placed in 6-inch lifts and compacted to the standards specified in the City-approved construction plans for site re-development.

5.7.1. Borrow Source Evaluation

Evaluation of the imported fill soil for the presence of contaminants must be concluded prior to their consideration for use as replacement fill at the site. Only fill materials that meet DTSC criteria will be transported to the site. A reasonable approach to confirming the absence of chemical contaminants for any potential fill sources is to follow DTSC’s Information Advisory on Clean Imported Fill Material. Following this guideline, it is anticipated that four samples for every 1,000 cubic yards plus one sample per each additional 500 cubic yards of imported soil will be taken. The samples will be analyzed for heavy metals (by USEPA methods 6010B and 7471A), asbestos (by polarized light microscopy), total petroleum hydrocarbons (by USEPA Method 3550) and pH (by USEPA Method 9040/9045).

5.7.2. Load Checking

All loads of imported fill will be checked by Organic Vapor Analyzer for each truckload entering the site and by visual screening for fuel/hydraulic oil leaks (or other staining) in soil placed for filling the site excavation.

5.7.3. Diversion of Unacceptable Borrow

Imported base material will be visually checked for unacceptable materials at the working face. If loads containing unacceptable materials (exhibit staining or detectable VOCs) are dumped, transporters of the unacceptable loads will be stopped before leaving the site.

Equipment operators will watch for evidence of contaminated imported fill in loads being dumped at the working face. If contaminated materials are found or suspected, the imported material is to be isolated. The hauler of the prohibited materials will be identified and the Engineer will be contacted to determine what appropriate actions will be taken.

Segregated, improper materials will be removed from the working face immediately. These materials will be reloaded to the transporter’s vehicle when possible or stockpiled in an appropriate area for later removal by a properly licensed waste hauler.

5.7.4. Documentation of Rejected Loads

All loads, which enter the site and are subsequently rejected, will be recorded. Data compiled will include when the incident occurred, who the hauler was, why the load was rejected, whether the load was dumped prior to rejection, and what steps were taken to remove the rejected material. Additional data may be recorded as deemed necessary for the particular situation.

A separate area will always be maintained for the storage of unacceptable materials, pending removal by the original transporter or a properly licensed waste hauler.

5.8. PROJECT SCHEDULE AND REPORT OF COMPLETION

Implementation of removal activities will begin after receiving approval of the RAW. The removal activities will be performed in conjunction with site redevelopment activities and will occur during the dry season (between April and October 2004). Table 8 summarizes the anticipated number of days for removal action implementation tasks.

A Report of Completion, documenting all activities conducted pursuant to an approved RAW and certifying that all activities have been conducted consistent with this RAW, will be prepared as expeditiously as possible upon completion of the removal action and submitted to DTSC for review and approval.

6.0 REFERENCES

Bay Area Air Quality Management District (BAAQMD). 1996. "Meteorological Monitoring Guidance." *Manual of Procedures*. Volume IV. Appendix A. May.

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TABLES

Table 1
Statistical Summary of Detected Compounds in Soil Samples[1]

Analyte	Number of Detections	Number of Samples	Minimum	Maximum[2]	Average	Standard Deviation	95% Upper Confidence Level (UCL) of the Mean	Frequency of Detection	USEPA Region IX PRGs[3]
			Concentration (µg/kg)						Concentration (µg/kg)
Pesticides									
Dieldrin	15	60	ND	240	12	31	19	25%	30
Diquat	8	12	ND	7,500	3317	2,271	4,494	67%	130,000
Endrin	6	60	ND	50	8.9	11	11	10%	18,000
4,4'-DDT	40	60	ND	380	39	64	53	67%	1,700
4,4'-DDE	40	60	ND	1,500	110	269	168	67%	1,700
alpha-Chlordane	4	60	ND	50	8.3	10	11	7%	1,600
gamma-Chlordane	4	60	ND	50	8.3	10	10	7%	1,600
Heptachlor epoxide	1	60	ND	50	8	10	10	2%	53
gamma-BHC (Lindane)	1	60	ND	94	9.1	15	12	2%	440
			Concentration (mg/kg)						Concentration (mg/kg)
Metals									
Arsenic	136	136	ND	37	11.2	8.1	12	100%	0.39
Barium	50	50	95	440	123	47	134	100%	5,400
Beryllium	3	50	ND	0.52	0.27	0.062	0.28	6%	150
Cadmium	50	50	1.7	3.6	2.8	0.33	2.9	100%	37
Chromium	50	50	27	55	38	4.4	39	100%	210
Cobalt	50	50	7.2	12	9.0	1.1	9.2	100%	900
Copper	50	50	21	39	29	5.2	30	100%	3,100
Cyanide	2	50	ND	0.32	0.18	0.047	0.19	4%	11
Lead	50	50	1.2	63	22	12	26	100%	400
Mercury	38	50	ND	0.28	0.074	0.054	0.087	76%	23
Nickel	50	50	39	60	48	4.5	49	100%	150
Vanadium	50	50	24	44	31	3.9	32	100%	550
Zinc	50	50	44	99	63	12	66	100%	23,000

Notes:

[1] Includes all data except: 020923-ENV-1-7.0, 020923-ENV-1-10.0, Rinseate (020801-DW-A) and Sediment trap liquid (030401-SEDPIT-1-W)

[2] Maximum detected concentration.

[3] October 1, 2002, *USEPA Region IX Prelimary Remediation Goals (PRGs)* for residential soil

ND = not detected

Table 2
Comparison of Background Concentrations of Inorganics in Soil

Inorganic Chemical	BAREC Concentration at 0.5 feet bgs: Number of Samples	Minimum (mg/kg)	Maximum (mg/kg)	Average (mg/kg)	BAREC Background Sample BG-A[1] (mg/kg)	Background Concentration: Number of Samples	Range (mg/kg)	Average (mg/kg)	Location/ Source
Arsenic	66	2.6	37	18	5.4	72	0.3 - 69	6.6	Western US/Dragun&Chiasson 1991
						50	0.6 - 11.0	3.5	California/Bradford et al. 1996
						108	ND - 20	2.9	Northern Santa Clara/Scott 1991
						1397	ND-42	5.5	Lawrence Berkeley National Laboratory/2002
Barium	50	95	440	123	440	75	150 - 1,500	687	Western US/Dragun&Chiasson 1991
						50	133 - 1,400	509	California/Bradford et al. 1996
						1397	ND-490	130	Lawrence Berkeley National Laboratory/2002
Beryllium	50	ND	0.52	0.27	ND	75	ND - 3.0	0.5	Western US/Dragun&Chiasson 1991
						50	0.25 - 2.70	1.3	California/Bradford et al. 1996
						158	ND - 3.2	0.9	Northern Santa Clara/Scott 1991
						1397	ND-1.2	0.42	Lawrence Berkeley National Laboratory/2002
Cadmium	50	1.7	3.6	2.8	2.4	24	0.01 - 22	3.5	Western US/Dragun&Chiasson 1991
						50	0.05 - 1.7	0.4	California/Bradford et al. 1996
						158	ND - 14	NC	Northern Santa Clara/Scott 1991
						1395	ND-7.5	NC	Lawrence Berkeley National Laboratory/2002
Chromium, total	50	27	55	38	55	75	10 - 1,500	118	Western US/Dragun&Chiasson 1991
						50	23 - 1,579	122	California/Bradford et al. 1996
						158	ND - 170	51	Northern Santa Clara/Scott 1991
						1403	ND-144	58	Lawrence Berkeley National Laboratory/2002
Cobalt	50	7.2	12	9	9.2	75	ND - 50	13	Western US/Dragun&Chiasson 1991
						50	2.7 - 46.9	15	California/Bradford et al. 1996
						1397	ND-29	14	Lawrence Berkeley National Laboratory/2002
Copper	50	21	39	29	31	75	5.0 - 300	49	Western US/Dragun&Chiasson 1991
						50	9.1 - 96.4	29	California/Bradford et al. 1996
						136	4.6 -67	36	Northern Santa Clara/Scott 1991
						1400	ND-69	32	Lawrence Berkeley National Laboratory/2002
Lead	50	1.2	63	23	1.2	75	ND - 300	29	Western US/Dragun&Chiasson 1991
						50	12.4 - 97.1	24	California/Bradford et al. 1996
						158	ND -54	11	Northern Santa Clara/Scott 1991
						1398	ND-84	7	Lawrence Berkeley National Laboratory/2002
Mercury	50	ND	0.28	0.07	0.15	73	0.01 - 1.5	0.15	Western US/Dragun&Chiasson 1991
						50	0.05 - 0.9	0.26	California/Bradford et al. 1996
						127	ND -1.3	NC	Northern Santa Clara/Scott 1991
						1406	ND-2.2	NC	Lawrence Berkeley National Laboratory/2002
Nickel	50	39	60	48	44	75	<5.0 - 200	38	Western US/Dragun&Chiasson 1991
						50	9 - 509	57	California/Bradford et al. 1996
						136	6 -145	74	Northern Santa Clara/Scott 1991
						1399	6 - 380	68	Lawrence Berkeley National Laboratory/2002
Vanadium	50	24	44	31	43	75	30 - 500	125	Western US/Dragun&Chiasson 1991
						50	39 - 288	112	California/Bradford et al. 1996
						1397	ND-120	46	Lawrence Berkeley National Laboratory/2002
Zinc	50	44	99	63	44	75	25 - 212	78	Western US/Dragun&Chiasson 1991
						50	88 - 236	149	California/Bradford et al. 1996
						136	7.8 -120	65	Northern Santa Clara/Scott 1991
						1396	3.8 - 190	64	Lawrence Berkeley National Laboratory/2002

Table 2
Comparison of Background Concentrations of Inorganics in Soil

	BAREC Concentration at 0.5 feet bgs				BAREC	Background Concentration			
Inorganic Chemical	Number of Samples	Minimum (mg/kg)	Maximum (mg/kg)	Average (mg/kg)	Background Sample BG-A[1] (mg/kg)	Number of Samples	Range (mg/kg)	Average (mg/kg)	Location/ Source

Notes:

NC = Not Calculated. ND - Not Detected

1 Collected at 0.75 feet below ground surface (bgs).

Sources:

Bradford, G.R., A.C. Chang, A.L. Page, D. Bakhtar, J.A. Frampton, and H. Wright. 1996. *Background Concentrations of Trace and Major Elements in California Soils.* Kearney Foundation Special Report. University of California, Division of Agriculture and Natural Resources, Kearney Foundation of Soil Science. March

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Table 3
Statistical Summary of Arsenic Results

	BAREC Arsenic Concentration (mg/kg)			
	All Data	**Shallow[1]**	**Deep[2]**	**Arsenic less than 20 mg/kg in Field 4[3]**
No. of Samples	*136*	*66*	*72*	*138*
Minimum Concentration	*0.5*	*2.6*	*0.5*	*0.5*
Maximum Concentration	*37.0*	*37*	*29*	*20*
Average Concentration	*11*	*16*	*7*	*9*
Standard Deviation	*8.1*	*7.1*	*6.0*	*5.4*
t-value	*1.7*	*1.7*	*1.7*	*1.7*
95% UCL of the Mean	*12*	*18*	*8*	*9*

Notes:
Calculations exclude decon water sample (020801-DW-A), and
Sediment trap liquid sample (030401-SEDPIT-1-W).

1 Shallow - samples at 0.5 feet below ground surface.

2 Deep - samples from greater than 2 feet below ground surface.

3 These statistics are for shallow and deep soil, and it is assumed that arsenic concentrations greater than 20 mg/kg are replaced with arsenic concentrations of 7 mg/kg.

Table 4
Potentially Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBCs)

Federal			
Standard, Requirement, Criteria, Limitation	**Citation**	**Description**	**Type of ARARs (Chemical, Location or Action; or a TBC)**
Classification and regulation of hazardous waste	42 USC 7401-7642	Establishes criteria for the determination of hazardous waste and its regulation	Chemical/Action
Hazardous Waste Identification	40 CFR 261.24	Establishes criteria to determine whether solid waste exhibits hazard characteristics of toxicity	Chemical/Action
Transport of Hazardous Waste	40 CFR 263	Standards applicable to transporters of hazardous waste	Action
Clean Air Act	42 USC 7401-7642	Emission Standards from stationary and mobile sources	Action
Occupational Health and Safety	29 CFR 1910.120	Establishes requirements for health and safety training.	Action
Health Risk Assessment	US EPA, Risk Assessment Guidance for Superfund, 1989	Guidance and framework to assess health risk	TBCs (Action)
Soil Screening Guidance	USEPA, Soil Screening Guidance, July 1996	Methodology for developing site-specific screening levels	TBCs (Chemical)
Preliminary Remediation Goals	US EPA, Region IX	Establishes screening numbers based on health risk assessment	TBCs (Chemical)

CFR - Code of Federal Regulation
USC - United States Code

Table 4
Potentially Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBCs)
(Continued)

State and Local			
Standard, Requirement, Criteria, Limitation	**Citation**	**Description**	**Type of ARARs (Chemical, Location or Action; or a TBC)**
Determination of Hazardous Waste	22 CCR 66260.1 et seq.	Establishes criteria for determining waste classification for the purposes of transportation and disposal of wastes	Chemical
Hazardous Waste Generator Requirements	22 CCR 66262.1 et seq.	Establishes standards applicable to generators of hazardous waste	Action
Ambient Air Quality Standards	H&S Sec. 39000-44071	Establishes standards for emissions of chemical vapors and dust	Chemical
Transportation of Hazardous Waste	22 CCR Chapter 13	Governs transportation of hazardous materials.	Action
Environmental Impact Review	Public Resources Code Sections 21000-21177	Mandates environmental impact review of projects approved by governmental agencies.	Action
Emission Standard	Regulation 6, Rule 40 Regulation 8	Establishes emission standard for particulate matter; and notification requirement.	Chemical
Grading permit	City of Santa Clara Ordinance	Permit required for site excavation and grading activities	Action
Stockpiling Requirements of Contaminated Soil	H&S Sec. 25123.3(a)(2)	Establishes standards for stockpiling of non-RCRA contaminated soil	Action
Occupational Health and Safety	8 CCR Sect. 1500, 2300, and 3200 et seq.	Establishes standards for working conditions and employees	Action

CCR - Code of California Regulation H&S - Health and Safety Code

Table 5
Estimated Cost of Alternative 2

Alternative 2 - Capping and Implementation of Institutional Controls				
Task Item	*Estimated No. of Units*	*Units*	*Unit Cost*	
Capital Costs				
Excavation and Capping Costs:				
Lab Sampling	50	ea.	$ 50.00	$ 2,500
Excavation and Load (Backhoe-loader, hydraulic, wheel mounted, 1-1/4 C.Y. cap.)	500	cy	$ 18.00	$ 9,000
Transportation and Disposal of Excavated Soil (18 cy dump truck)	500	cy	$ 45.00	$ 22,500
Dust Control (water truck rental, with operator)	5	day	$ 875.00	$ 4,375
Import & Hauling of Clean Fill Material (12 cy dump truck, 10 mile round trip, 0.60 load/hr) for cap and excavated areas	4337	cy	$ 25.00	$ 108,426
Placement of Clean Fill Material (dozer, no compaction)	4337	cy	$ 2.00	$ 8,674
Mobilization of Dozer for placement (up to 50 miles)	1	LS	$ 279.26	$ 279
Demobilization of Dozer for placement (up to 50 miles)	1	LS	$ 279.26	$ 279
Compaction of Fill Material (walk behind, vibrating plate 18" wide, 6" lifts, 4 passes)	4337	cy	$ 2.50	$ 10,843
Access/Egress Adjustments (Gate for 6' high fence, galv. Steel)	2	LS	$ 330.03	$ 660
Air Monitoring	1	LS	$ 20,000.00	$ 20,000
Preparation of Site Management Plan	1	LS	$ 50,000.00	$ 50,000
Institutional Controls	1	LS	$ 50,000.00	$ 50,000
Preparation of Remedial Activities Documentation Report	1	LS	$ 25,000.00	$ 25,000
Engineering and Design (15%)				**$ 46,880**
Contingency (15%)				**$ 46,880**
Total Estimated Capital Costs				**$ 406,297**
Annual Operation and Maintenance				
Cap Maintenance (includes periodic patching and inspection)	1	LS	$ 5,000.00	$ 5,000
Contingency (20%)				$ 1,000
Subtotal Annual O&M Costs				**$ 6,000**
Present Value	30	years	7%	$ 74,454
Total Estimated Capital and O&M Costs				$ 480,751

Table 6
Estimated Cost of Alternative 3

Alternative-3 - Excavation with Off-site Disposal				
Task Item	*Estimated No. of Units*	*Units*	*Unit Cost*	
Excavation (Arsenic Cleanup Goal of 20 ppm) Costs:				
Lab Sampling	150	ea.	$ 50.00	$ 7,500
Excavation and Load (Backhoe-loader, hydraulic, wheel mounted, 1-1/4 C.Y. cap.)	6000	cy	$ 18.00	$ 108,000
Transportation and Disposal of Excavated Soil (18 cy dump truck)	6000	cy	$ 45.00	$ 270,000
Dust Control (water truck rental, with operator)	10	day	$ 875.00	$ 8,750
Import & Hauling of Clean Fill Material (12 cy dump truck, 10 mile round trip, 0.60 load/hr)	6000	cy	$ 25.00	$ 150,000
Placement of Clean Fill Material (dozer, no compaction)	6000	cy	$ 2.00	$ 12,000
Mobilization of Dozer for placement (up to 50 miles)	1	LS	$ 279.26	$ 279
Demobilization of Dozer for placement (up to 50 miles)	1	LS	$ 279.26	$ 279
Compaction of Fill Material (walk behind, vibrating plate 18" wide, 6" lifts, 4 passes)	6000	cy	$ 2.50	$ 15,000
Access/Egress Adjustments (Gate for 6' high fence, galv. Steel)	2	LS	$ 330.03	$ 660
Air Monitoring	1	LS	$ 75,000.00	$ 75,000
Preparation of Remedial Activities Documentation Report	1	LS	$ 25,000.00	$ 25,000
Engineering and Design (15%)				**$ 100,870**
Contingency (15%)				**$ 100,870**
Total Estimated Cost				**$ 874,209**

Table 7
Comparative Analysis of Alternatives

	Removal Action Alternative - Rating Points		
Criterion	Alternative 1: No Action	Alternative 2: Capping and Implementation of Institutional Controls	Alternative 3: Excavation with Offsite Disposal
Effectiveness			
Ability to Meet RAOs	0	1	1
Compliance with Cleanup Goals	0	0	1
Reduction of Mobility and/or Volume	0	0.5	1
Long-Term Effectiveness and Permanence	0	0	1
Short-Term Effectiveness	0	1	1
Implementability			
Technical/Administrative Feasibility	1	0	1
Availability of Goods & Services	1	1	1
Ease of Construction	1	1	1
State and Community Acceptance	0	1	2
Cost	5	3	1
TOTAL	8	8.5	11

Table 8
Anticipated Number of Days for Project Implementation and Reporting

Schedule of Tasks			
Task	**Days[10] to Complete**	**Cumulative Days**	**Notes**
Building Demolition	14	14	Not part of RAW, but must be completed prior to RAW implementation
Site Preparation	7	21	
Excavation Activities	14	35	Assumes minimal weather delays
Site Restoration	7	42	
Reporting	28	70	

10 Calendar days

FIGURES

APPENDICES

APPENDIX A
TRANSPORTATION PLAN

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1.0 INTRODUCTION

The former University of California (UC) Bay Area Research and Extension Center (BAREC) is located on 90 North Winchester Boulevard in Santa Clara, California (the site), as shown in Figure 1 of the Removal Action Workplan (RAW). The area surrounding the site consists primarily of residential and commercial land. Immediately surrounding the site to the north, west and south are residential homes. To the south of the site along Winchester Boulevard, there is a commercial building, a veterinary clinic and a parking lot. To the east, northeast and southeast beyond Winchester Boulevard are areas used for commercial purposes.

An environmental investigation was conducted at the former UC BAREC to determine whether current or past chemical use at the site has resulted in soil concentrations that might pose a threat to public health and the environment. The BAREC was used as an agricultural research station since the 1920s. Part of the research at the BAREC involved demonstrating the efficacy of a variety of research and development (R&D) pesticides. Fourteen of the 90 chemicals used on crops at the research station were considered of potential concern because of their toxicity and persistence in the environment. Arsenic and dieldrin were the chemicals of potential concern that were found at concentrations above USEPA Preliminary Remediation Goals in surface soils.

Based on the additional soil sampling results, a Removal Action Workplan (RAW) has been prepared to address the elevated concentrations of pesticides-related chemicals in the eastern sector of Field 4 and three hot spots. Excavation and offsite disposal of soils with elevated arsenic and dieldrin levels was recommended based on effectiveness, implementablility and cost. Soil with concentrations above clean-up goals are planned to be excavated from the site and disposed of at a nearby non-hazardous, municipal landfill. This Transportation Plan is prepared as a key component of the RAW. All removal, transportation and disposal activities will be performed in accordance with all applicable federal, state, and local laws, regulations, and ordinances.

2.0 WASTE TRANSPORTATION, HANDLING AND MANAGEMENT

The volume of excavated soil is estimated to be approximately 6,000 cubic yards. The chemicals of potential concern in the excavated soil driving the removal effort are arsenic and dieldrin.

2.1. WASTE PROFILE

The waste material will be profiled for acceptance by the disposal facility and approval from the disposal facility will be obtained before any excavation activities commence. Additional documentation will be provided to DTSC pertaining to waste disposal profiles and waste disposal acceptance prior to any off-site shipments of waste.

2.2. REQUIREMENT OF TRANSPORTERS

Only qualified transporters will be hired for hauling the excavated soil off-site. The selected transporters will be fully licensed and insured to transport the excavated soil.

2.3. TRAFFIC CONTROL PROCEDURES

Impacted soil for off-site disposal will be transported in end-dump trailers/trucks to the designated disposal facility. Prior to loading, all dump trucks will be staged on site to avoid impacts on the local streets. Dump trucks to be loaded will not be allowed to cross removal or staging areas. Traffic will be coordinated in such a manner that, at any given time, no more than three dump trucks will be on the site, to reduce truck traffic on surrounding surface streets and reduce dust generation during on-site transportation. While on the site, all vehicles will be required to maintain slow speeds (i.e., less than five miles per hour) for safety purposes and for dust control measures. A traffic flag person will be used to control truck traffic entering and leaving the site.

2.4. TRUCK LOADING OPERATIONS

Trucks will be loaded on the designated portion of the staging area. A hydraulic backhoe (or similar equipment) will load the soil from the stockpile into dump trucks for transportation to the designated disposal facility. All vehicles will be decontaminated prior to leaving the work area. All stray waste material on vehicles, tires, etc., will be brushed off and sprayed off with water, if necessary. Then the dump truck will be covered with a tarp to prevent the excavated soil and/or dust from spilling out of the truck during transport to the disposal facility. Prior to leaving the load-out area, each truck will be inspected by the site manager to ensure that the payloads are adequately covered, the trucks are cleaned of contaminated soil, and the shipment is properly documented. Each truck will receive the proper placarding and paper work. Water spray or mist, as appropriate, will be applied during loading operations for dust control purposes.

2.5. SHIPMENT DOCUMENTATION

Non-hazardous Waste Shipment

Assuming the excavated soil is profiled as non-hazardous waste, a proper shipping document (such as bill of landing or invoice or non-hazardous waste manifest) will be used to document and accompany each truck shipment. At a minimum, the shipping document will include the following information:

- Name and Address of Waste Generator
- Name and Address of Waste Transporter
- Name and Address of Disposal Facility
- Description of the Waste
- Quantity of Waste Shipped

The site manager will maintain a copy of the shipping document for each truckload on-site until completion of the removal action.

2.6. OFF-SITE LAND DISPOSAL FACILITIES

For the purposes of this Transportation Plan, the soil is assumed to be non-hazardous waste. The material is planned to be transported to a Class 3 landfill. Specified below are two nearby landfills appropriate for the disposal of the excavated soil:

BFI Newby Island Landfill
1601 Dixon Landing Road
Milpitas, California 95035
Phone: (408) 262-8100

or

Kirby Canyon Landfill
910 Coyote Creek Golf Drive
Morgan Hill, California 95037

Phone: (408) 779-2206

Final determination of the landfill selected for disposal will be based on approval from the landfill. Once the landfill is determined, DTSC will be notified by email and/or telephone.

2.7. TRANSPORTATION ROUTES

Transportation of the excavated soil will be on arterial streets and/or freeways approved for truck traffic to minimize any potential impact on the local neighborhood. If the soil is accepted by the BFI Newby Island Landfill, the transport trucks will exit the site on North Winchester Boulevard and turn right to travel south for approximately 0.3 miles to Stevens Creek Boulevard; turn left on Stevens Creek Boulevard; and take the ramp for northbound Interstate 880 Freeway and travel for approximately 9.3 miles, take the Dixon Landing Road West exit. By turning right off the freeway ramp, the trucks will arrive at the BFI Newby Island Landfill, located at 1601 Dixon Landing Road. Figure 1 shows the proposed transportation route.

If the soil is accepted by the Kirby Canyon Landfill, the transport trucks will exit the site on North Winchester Boulevard and turn right to travel south for approximately 0.3 miles to Stevens Creek Boulevard; turn left on Stevens Creek Boulevard; and then take the on-ramp for the southbound California Highway 17 and travel for approximately 0.7 miles. The trucks will merge onto the southbound Interstate 280 Freeway and travel for approximately 2.6 miles; exit at the Guadalupe Parkway and continue on the southbound California Highway 87 for 4.9 miles, take the southbound California Highway 85 exit and continue for 5.2 miles, then take the Bernal Road exit; turn right on Bernal Road to Monterey Highway. Turn left on Monterey Highway and travel for 5.4 miles, and then turn left on Kirby Avenue to reach the landfill. Figure 2 shows the proposed route to the Kirby Canyon Landfill.

Approximately 30 to 35 truckloads of soil will be transported off-site per day. Transportation will be timed to avoid peak traffic hours.

2.8. RECORDKEEPING

The excavation contractor will be responsible for maintaining a field logbook during the removal action activities. The field logbook will serve to document observations, personnel on-site, truck arrival and departure times, and other vital project information.

2.9. HEALTH AND SAFETY

A health and safety plan (HASP) for the site has been prepared and included as Appendix B of the RAW. The selected contractor will prepare a site-specific HASP prior to initiation of site work. Everyone working at the site will be required to be familiar with the site-specific HASP.

2.10. CONTINGENCY PLAN

Each waste hauler is required to have a contingency plan prepared for emergency situations (vehicle breakdown, accident, spill or leak of materials, fire, explosion, etc.) during transportation of excavated soil from the Site to the designated disposal facility. Once the waste hauler is selected, a copy of its contingency plan will be attached to this Transportation Plan.

Figure 1. Proposed Route of Transportation to the BFI Newby Island Landfill

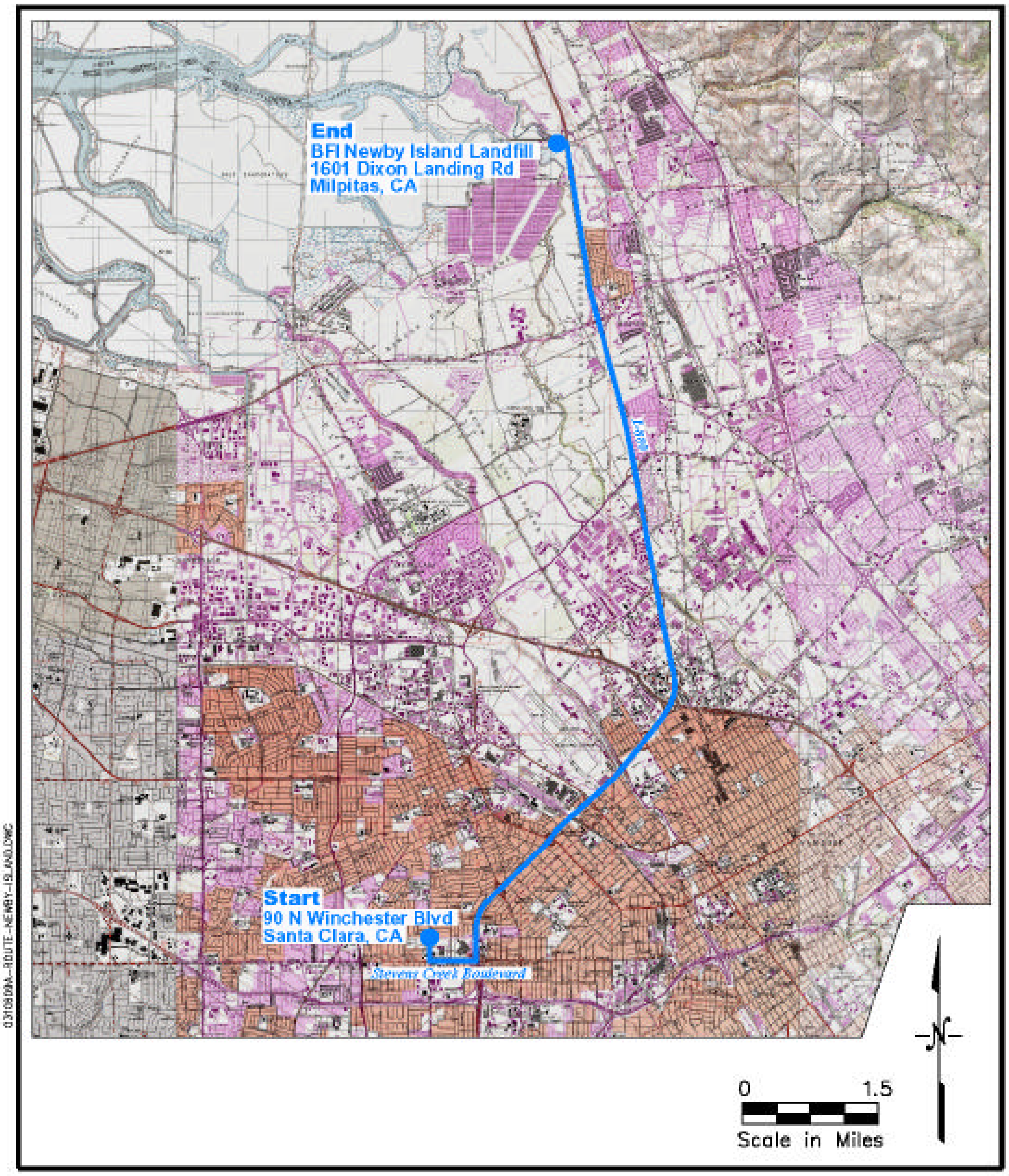
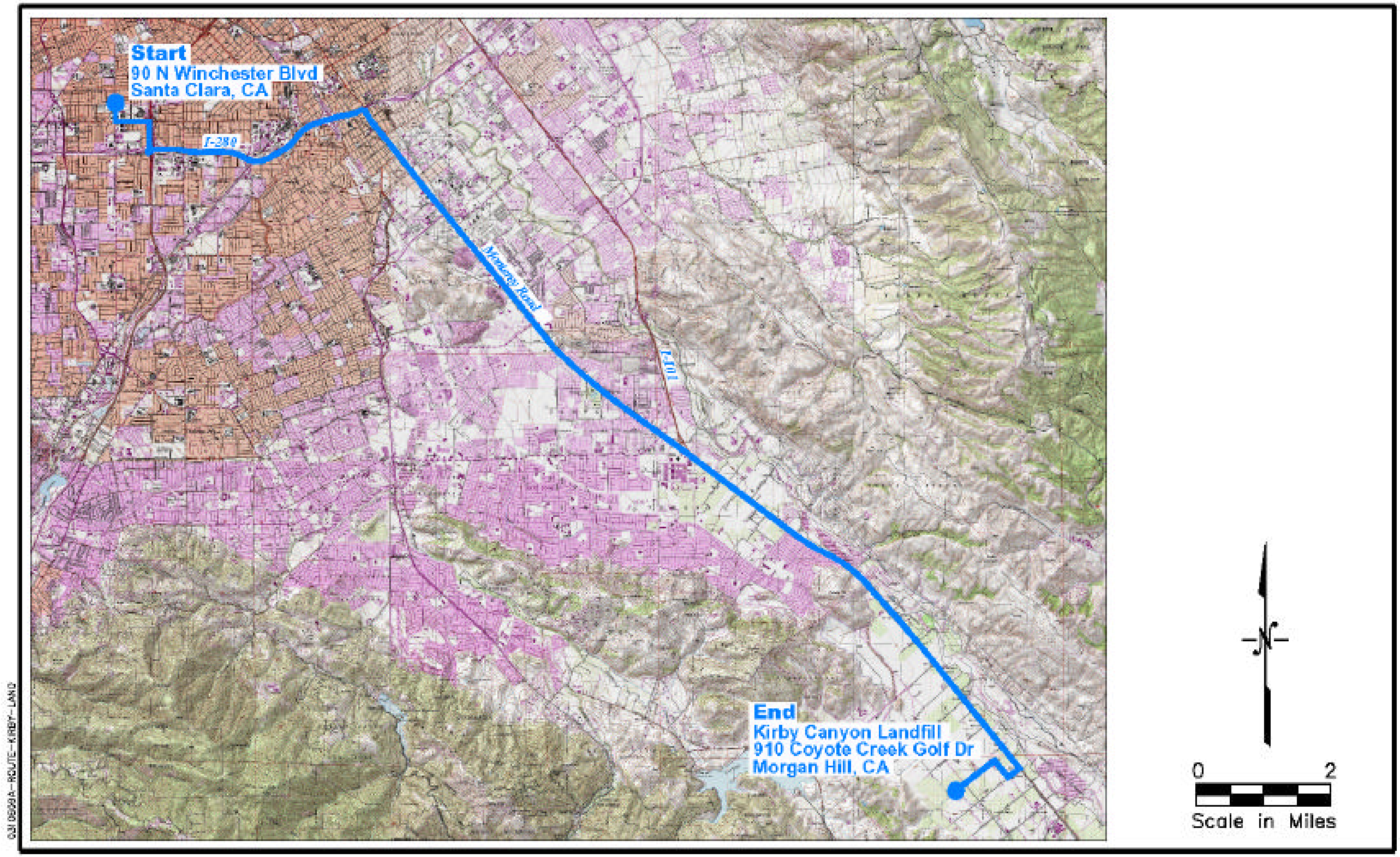


Figure 2. Proposed Route of Transportation to Kirby Canyon Landfill



APPENDIX B
SOIL SAMPLING AND ANALYSIS PLAN

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1.0 INTRODUCTION

This Soil Sampling and Analysis and Quality Assurance Project Plan (SAP/QAPP) has been prepared on behalf of the California State Department of General Services by ENVIRON International Corporation (ENVIRON). The purpose of this SAP/QAPP is to:

(1) describe the scope of work for soil sampling and laboratory analysis;
(2) describe the quality assurance/quality control (QA/QC) procedures the project team will follow during analysis of samples collected at the Former BAREC property; and,
(3) assure reporting of data that are representative of field conditions, and are legally defensible.

The SAP/QAPP is based on guidelines issued by the United States Environmental Protection Agency (USEPA) (USEPA, 1988, 1989, 1994, 1998, 2001), and reflects the selection of STL San Francisco laboratory for analysis of samples.

2.0 SCOPE OF SOIL SAMPLING

2.1 Problem Definition and Background

The problem definition and background details for this project are discussed in Sections 2.1 and 2.2 of the Removal Action Workplan (RAW).

2.2 Sampling Project/Task Description

A summary of work to be performed for this project is provided in detail in Section 5.0 of the RAW. The soil sampling work consists of the following main elements:

- Collection of soil samples below former building foundations to confirm that soil below former buildings have not been adversely affected from prior operations at the BAREC property. The scope of this sampling is described in Section 5.1.1 of the RAW;
- Collection of soil samples to determine the extent of excavation of impacted soils ("Pre-Excavation Sampling"). The scope of this sampling is described in Section 5.1.4 and 5.3.1 of the RAW; and
- Collection of soil samples to verify that impacted soils have been removed ("Post-Excavation Sampling"). The scope of this sampling is described in Section 5.1.4 and 5.3.1 of the RAW

A map showing proposed locations of field tasks is included in the RAW as Figure 7. The schedule for implementation of project tasks is described in Section 5.8 and Table 8 of the RAW.

2.3 Sampling Methods

The samples will be collected in-situ using a standard core sampler attached to a slide hammer. In cases where the excavation depth prevents safe entry, soil will be taken from the selected location using the backhoe. The sample will be collected from the backhoe bucket using the standard core sampler. Soil samples will be collected in factory pre-cleaned brass or stainless steel liners.

2.4 Sample Handling and Custody

Standard EPA procedures to identify, track, monitor and maintain chain-of-custody for all samples will be implemented. Soil samples will be handled using the following procedures:

1. The sampler will don clean gloves appropriate for the chemicals of concern before touching any sample containers, and care will be taken to avoid direct contact with the sample.

2. The sample will be quickly observed for color, appearance, and composition and

recorded in the field soil boring log. The ends of the liners will be immediately covered with Teflon® sheeting, capped with plastic end caps, and sealed with Silicone tape.

3. The sample container will be labeled before or immediately after sampling with a self-adhesive label having the following information written in waterproof ink:

    - Company name
    - Project name
    - Project number
    - Sample ID number
    - Date and time sample was collected
    - Initials of sample collector

4. The sample will be placed in an ice chest kept at 4 °C for transport to the laboratory within 24 hours of collection.

2.5 Analytical Methods

Soil Samples Below Building Foundations

Soil samples collected from beneath the former building foundations will be analyzed for asbestos by EPA Method 600/R-93-116, lead and arsenic by EPA Method 6010B, organochlorine pesticides by EPA Method 8081A, and petroleum hydrocarbons by EPA Method 8015 Modified.

Pre- and Post-Excavation Samples

Soil samples from excavation areas will be analyzed for arsenic by EPA Method 6010B or dieldrin by EPA Method 8081A. Table B-1 lists the chemical analytical methods anticipated for this project and the proposed reporting limits for target analytes.

2.6 Equipment Decontamination

The soil sampler will be washed with a laboratory-grade alconox detergent and water solution to remove residual soil and rinsed with deionized water between sampling.

Construction equipment and transportation vehicles will be decontaminated as described in Section 5.3.3 in the RAW.

2.7 Quality Control

The requirements and procedures for maintaining laboratory quality control for project data are described in Section 4.3 below.

3.0 PROJECT/TASK ORGANIZATION

Personnel assigned to the project will be required to familiarize themselves with pertinent protocols and procedures presented in the SAP/QAPP. The following paragraphs identify and describe the responsibilities of key project positions related to project management, chemical data quality management and subcontractor relationships.

3.1 Key Project Positions

Project Director and Assistant Project Director - The Project Director is responsible for reviewing technical and policy decisions regarding the project, including interaction and coordination with California State Department of General Services, the regulatory agencies, ENVIRON, and subcontractor personnel.

Technical Peer Reviewer - The Technical Peer Reviewer is responsible for reviewing technical aspects of the work including QA/QC, strategies, methods to be used, and key reports.

Project Manager - The Project Manager is responsible for the scope, cost, and technical considerations related to the project; staff and project coordination; and implementation of review of overall project quality to the collection, completeness, and presentation of data.

Project Quality Assurance Officer - The Project Quality Assurance (QA) Officer is responsible for reviewing the project QA program as it relates to the collection and completeness of data from field and laboratory operations, including the training of personnel to follow established protocols and procedures. This individual is also responsible for maintaining the official, approved SAP/QAPP.

Task Leaders - Task Leaders are responsible for formulating a work plan and executing work elements related to an assigned task. Each Task Leader will issue specific instructions for performing assigned work elements and will ensure that work is conducted in compliance with project-specific objectives and applicable QA procedures. Task Leaders will coordinate with the Project Manager and QA Officer to review general work plans and specific work elements.

3.2 Quality Objectives and Criteria for Measurement Data

Measurement performance criteria are outlined in Sections 4.6 through 4.8 in Severn Trent Laboratories (STL) San Francisco Quality Assurance Manual, Revision 10, January 2002 (STL QA Manual). A copy of the STL QA Manual is included as Attachment A to the SAP/QAPP.

3.3 Special Training and Certification

No specialized training of field personnel is required for this project. All personnel involved in field sampling shall have completed the emergency response and hazardous waste operations training requirements defined in Title 29 Code of Federal Regulations Part 1910.120. Furthermore, fieldwork personnel for this project are appropriately trained for the sampling activities that will be conducted.

The training programs implemented by the laboratory for its personnel are described in Section 8.0 of the STL QA Manual in Attachment A.

3.4 Documentation and Records

The most current, approved version of the SAP/QAPP will be provided to the appropriate project personnel prior to the initiation of field activities.

Documents related to field activities conducted will be submitted with the Report of Sampling Results, which will be completed following field activities. These documents include field investigation daily logs, daily calibration logs, chain-of-custody records and corrective action reports. Laboratory-specific records will be compiled by STL in a “Level III Report” (USEPA report, “Guidance for Data Useability in Risk Assessment (Part A) Final” (DURA)), which is discussed in Section 4.3.3 of the STL Quality Assurance Manual (Attachment A) and includes the following elements:

- Sample data such as sampling date, submission date, extraction and analytical dates, method used, sample results, dilution factors, reporting limits, and GC fingerprint chromatograms
- Sample management records such as cooler receipt forms, chain-of-custody records, and a sample receipt check list
- Test method records such as method summaries, sample preparation logs, run sequences and injection time logs
- QA/QC documents such as calibration summaries, laboratory control sample results, surrogate recoveries, matrix spike results, method blank results, preparation and instrument analysis logs, and QC reports

According to the STL QA Manual Section 12.4, laboratory-specific records will be kept in storage for a period of at least five years. Project-related documents will be retained by ENVIRON in the Emeryville office for a period of five years.

4.0 DATA GENERATION AND ACQUISITION

4.1 Sample Handling and Custody

Standard EPA procedures to identify, track, monitor and maintain chain-of-custody for all samples will be implemented as discussed in Section 2.4.

Laboratory sample handling and custody procedures are described in Section 4.1 of the STL QA Manual (Attachment A).

4.2 Analytical Methods

As discussed above, soil samples collected from beneath the former building foundations will be analyzed for asbestos by EPA Method 600/R-93-116, lead and arsenic by EPA Method 6010B, organochlorine pesticides by EPA Method 8081A, and petroleum hydrocarbons by EPA Method 8015 Modified. Soil samples from excavation areas will be analyzed for arsenic by EPA Method 6010B or dieldrin by EPA Method 8081A. Table B-1 list the chemical analytical methods anticipated for this project and the proposed reporting limits for target analytes. In general, samples will be processed as a batch. Samples will be processed sequentially, and samples to be analyzed by a given method will be generally processed on the same apparatus. Samples will be processed without interruption of samples from other projects. At a minimum, the laboratory will perform matrix spikes on one of each ten project samples, or one per sample delivery batch, per matrix type, whichever is more frequent, and independent of the number of analytical instruments used. Samples will be analyzed so that each detected analyte will be quantified within its respective linear range of calibration of the analytical instrument; if analytes are detected outside the linear range of calibration, the sample will be re-analyzed with an appropriate dilution and within holding times so that the analyte can be properly quantified. Additional information on laboratory analytical procedures is included in Section 3.2 of the STL QA Manual (see Attachment A).

Corrective actions for any failures in the analytical system will be handled by STL San Francisco. Section 6.0 of the STL QA manual identifies the personnel responsible for corrective actions as well as related procedures and documentation.

4.3 Quality Control

The requirements and procedures for maintaining laboratory quality control for project data are described below. More details on QC procedures conducted by the laboratory are provided in Section 4.5 of the STL QA Manual (see Attachment A).

4.3.1 Quality Control Samples

To evaluate the precision and accuracy of analytical data, laboratory quality control samples will be analyzed periodically for this project. The minimum project requirements for collection and analysis of these samples are listed in the subsections below.

4.3.1.1 Matrix Spikes and Matrix-Spike Duplicates

A matrix spike is an aliquot of a project sample, either soil or water, to which the laboratory adds a known quantity of a compound prior to sample extraction/digestion and analysis. The reported percent recovery of the known compound in the sample indicates the presence or absence of any effects of the matrix on the sample analyses. A matrix-spike duplicate is an aliquot of the matrix-spike sample that is analyzed separately; the results indicate the precision of the analytical method. A matrix-spike and matrix-spike duplicate analysis will be performed on at least one of each ten project samples, or one per sample delivery batch, per matrix type, whichever is more frequent, and independent of the number of analytical instruments used.

4.3.1.2 Method Blanks

A method blank consists of a laboratory-prepared sample that is carried through the entire analytical procedure. Method blanks for soil and water analyses consist of deionized and/or organic-free water, while method blanks for soil gas analyses consist of ambient air. The purpose of method blanks is to check for laboratory contamination during preparation and analysis of soil, water or soil gas samples. Method blanks will be prepared and analyzed at least once with each analytical batch, with a minimum of one for every 20 samples.

4.3.1.3 Laboratory Control Sample

A laboratory control sample (LCS), or check sample, is a sample prepared by the laboratory or a reliable source that contains known concentrations of the analytes of concern. It is subjected to the same preparation/extraction procedures as a soil, soil gas or water sample, and is prepared independently of calibration standards. The LCS recovery checks the accuracy of the analytical methods and equipment, and will be prepared and analyzed at least once with each analytical batch, with a minimum of one for every 20 samples. LCS recoveries should fall within the limits set by the laboratory.

4.3.1.4 Laboratory Surrogate Compounds

A surrogate spike is an addition to the soil, soil gas or water sample of a known concentration of an organic compound that is not expected to be a compound of concern in the sample. Every blank, QC sample, and project sample will be spiked with surrogate compounds if specified in the particular analytical method (they are not required for metals analyses). Surrogate recovery should fall within the limits set by the laboratory in accordance with procedures specified by the method.

4.3.2 Calculation of QC Statistics

The validity of chemical data will be measured in terms of precision, accuracy, completeness, and representativeness. The ways in which these four parameters will be evaluated for project data are described below. These calculations are also discussed in Sections 4.6 and 4.7 of the STL QA Manual in Attachment A.

4.3.2.1 Precision

For chemical data generated by the laboratory, data precision will be estimated by comparing analytical results from duplicate samples and from matrix spikes and matrix-spike duplicates. The comparison will be made by calculating the relative percent difference (RPD) given by the following equation:

$$RPD = \frac{2(S_1 - S_2)}{S_1 + S_2} \, x \, 100$$

Where S_1 = sample
S_2 = duplicate

This information will be calculated and reviewed periodically by the Project Manager and/or Project QA Officer. The goals for data precision are summarized in Table B-2. RPD goals are applicable only for samples with detected concentrations greater than five times the reporting limit.

4.3.2.2 Accuracy

Data accuracy will be assessed for laboratory data only and is based on recoveries (R), expressed as the percentage of the true (known) concentration, from laboratory-spiked samples (i.e., matrix spikes, matrix spike duplicates, and laboratory control samples) generated by the analytical laboratory. The equation for calculating recoveries is:

$$R = \frac{(A - B)}{T} \, x \, 100$$

Where A = measured concentration after spiking

B = background concentration
T = known true value of spike

This information will be reviewed periodically by the Project Manager and/or Project QA Officer. The goals for the recovery of selected target analytes in laboratory-spiked samples are presented in Table B-2. These goals may need to be modified depending upon potential matrix interferences associated with the site samples. Alteration or failure to meet these preliminary goals should not be construed to indicate that the data is unsuitable for site characterization and risk assessment as long as the uncertainty associated with the data is adequately characterized (USEPA, 1992).

4.3.2.3 Completeness

Data generated during the investigation will be evaluated for completeness, that is, the amount of data meeting project precision and accuracy goals presented in Table B-2. If data generated via analytical procedures appear to deviate significantly from observed trends, the Project Manager and/or Project QA Officer will review field or laboratory procedures with the appropriate personnel to evaluate the cause of such deviations. Where data anomalies cannot be explained, resampling may be necessary.

4.3.2.4 Representativeness

The representativeness of the data is the degree to which data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Analytical data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix. Field duplicate samples will be collected as a means to assess field representativeness, in addition to being used to assess precision as described in Section 4.3.2.1. Trip blanks will be included in each sample shipment and will contain water samples for volatile organic analysis to evaluate potential cross contamination during transport. Representativeness will also be ensured by use of proper collection protocols as specified in Section 2.3 and 2.4.

4.3.3 Data Review

The Project Manager, Project QA Officer, or appropriate Task Leader assigned by the Project Manager, will review laboratory data. Section 4.3.2 outlines the procedures for evaluating the precision and accuracy of data. If comparison of data to previous measurements or known conditions at the site indicates anomalies, the laboratory will be instructed to review the submitted data while the methods used to collect and handle the samples is reviewed. If anomalies remain, the laboratory may be asked to re-analyze selected samples; other possible corrective actions are discussed below.

4.3.4 Corrective Actions

Corrective actions may be initiated if the precision or accuracy goals listed in Table B-2 are not achieved. The initial step in corrective action will be to instruct the analytical laboratory to examine its procedures to assess whether analytical or computational errors caused the anomalous results. At the same time, sample collection and handling procedures will be reviewed to assess whether they could have contributed to the anomalous results. Based on this evaluation, the Project Manager, with the Project QA Officer, will assess whether re-analysis or resampling is required or whether any protocol should be modified for future sampling events. Laboratory corrective actions are described in the laboratory quality assurance manuals. Any changes in laboratory methods, or quality assurance parameters or limits require written approval prior to implementation by the laboratory.

4.4 Instrument/Equipment Testing, Inspection and Maintenance

Information regarding testing, inspection and maintenance of laboratory equipment, including preventative maintenance schedules, is provided in Section 5.3 of the STL QA Manual in Attachment A.

4.5 Instrument/Equipment Calibration and Frequency

Details on calibration procedures for laboratory equipment, including frequency and techniques, are provided in Section 5.2 of the STL QA Manual in Attachment A.

4.6 Inspection/Acceptance of Supplies and Consumables

Project Managers have primary responsibility for identifying the types and quantities of supplies and consumables needed for environmental data collection projects. Supplies and consumables will be received in the field. When supplies are received, the Field Task Leader will inspect the supplies to ensure that they meet the inspection and acceptance requirements. All inspection and acceptance requirements for supplies and consumables (including reagents, standards, water and glassware) used by the laboratory are presented in Section 9 of the STL QA Manual in Attachment A.

4.7 Data Management

New analytical data for the project will be generated and reported by the lab. Information regarding data reduction, validation and reporting by the laboratory is provided in Section 4.3 of the STL QA Manual (see Attachment A). Details on the storage of data at the laboratory are presented in Section 12 of the STL QA Manual.

Analytical data will be provided by the laboratory in electronic format via email followed by a mailed hard copy report. The electronic data will be entered and maintained in a project database. Analytical results in the database will be checked against the hard copy report upon their receipt.

5.0 ASSESSMENT AND OVERSIGHT

5.1 Assessments and Response Actions

Assessments that will be performed for this project include laboratory audits, data reviews and peer reviews of data analysis reports. Section 11 of the STL QA Manual in Attachment A describes laboratory audit procedures and related response actions.

The Project Manager, Project QA Officer, or appropriate Task Leader assigned by the Project Manager, will review laboratory data. If comparison of data to previous measurements or known conditions at the site indicates anomalies, the laboratory will be instructed to review the submitted data while the methods used to collect and handle the samples are reviewed. If anomalies remain, the laboratory may be asked to re-analyze selected samples; other possible corrective actions are discussed in Section 4.3.4. Reports related to this project will be peer-reviewed by the Technical Peer Reviewer.

5.2 Reports to Management

The Project Manager will be provided with monthly status reports that will address any work assignment-specific QA issues. Identification of these issues will be facilitated by communication among all project participants.

6.0 DATA VALIDATION AND USABILITY

6.1 Data Review, Verification, and Validation

The criteria for reviewing and validating data are outlined in Sections 4.3, 4.7 and 4.8 of the STL QA Manual in Attachment A. Precision and accuracy goals for data are presented in Table B-2.

6.2 Verification and Validation Methods

The validity of chemical data will be measured in terms of precision, accuracy, completeness, and representativeness. Methods to determine these parameters are discussed in Section 4.3.2.

6.3 Reconciliation with User Requirements

Reconciliation of the sampling and analysis results with the requirements defined by the decisions makers will be discussed in the Report of Sampling Results, which will be prepared following completion of field activities and receipt of laboratory analytical data.

7.0 REFERENCES

U.S. Environmental Protection Agency (USEPA). 2001. EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5.

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TABLES

Table B-1
ESTIMATED REPORTING LIMITS AND PRELIMINARY REMEDIATION GOALS FOR SOIL

Analytical Parameters and Analytes	Method Reference and Number	RL[a] (mg/kg)	Residential PRGs (mg/kg)
Asbestos	600/R-93-116	1%	NA
Organochlorine Pesticides	8081		
4,4'-DDD		0.002	2.4
4,4'-DDE		0.002	1.7
4,4'4-DDT		0.002	1.7
4,4'-Methyoxychlor		0.002	310
Aldrin		0.002	0.029
alpha-BHC		0.002	0.09
alpha-Chlordane		0.002	NA
beta-BHC		0.002	0.32
Chlordane (Technical)		0.050	1.6
delta-BHC		0.002	NA
Dieldrin		0.002	0.03
Endosulfan I		0.002	370
Endosulfan II		0.002	370
Endosulfan sulfate		0.002	370
Endrin		0.002	18
Endrin aldehyde		0.002	NA
Endrin ketone		0.002	NA
gamma-BHC (Lindane)		0.002	0.44
gamma-Chlordane		0.002	NA
Heptachlor		0.002	0.11
Heptachlor epoxide		0.002	0.053
Toxaphene		0.10	0.44
Metals	6010B		
Arsenic		1	0.39
Lead		1	400
Petroleum Hydrocarbons	8015M		
Diesel		1	NA
Gasoline		1	NA
Kerosene		1	NA
Motor Oil		50	NA

Notes:
mg/kg = milligrams per kilogram
NA = not available
PRGs = EPA Region IX Preliminary Remediation Goals, October 2002
(a) Reporting limits (RLs) are highly matrix dependent and the values listed are provided for guidance and may not always be achievable. Sample RLs may be higher for samples that require dilution or if matrix interferences are present.

Table B-2
QUALITY ASSURANCE GOALS FOR FIELD AND LABORATORY ANALYSES

Tests	Compounds	Spike level µg/Kg	Soil Limits (%)	% RPD Limit
8081 Pesticides				
Surrogate	2,4,5,6-Tetrachloro-m-xylene	50	50-125	-
	Decachlorobiphenyl	50	46-242	-
MS/MSD	Aldrin	50	37-136	25
	y-BHC	50	37-137	35
	p,p'-DDT	50	55-132	35
	Dieldrin	50	58-135	35
	Endrin	50	58-134	35
	Heptachlor	50	40-136	20
LCS	Aldrin	50	37-136	25
	y-BHC	50	37-137	35
	p,p'-DDT			20
	Dieldrin	50	58-135	35
	Endrin	50	58-134	35
	Heptachlor	50	40-136	20
6010-Metals				
MS/MSD	Arsenic	100	80-120	20
	Lead	100	80-120	20
8015M - Petroluem Hydrocarbons				
Surrogate	o-Terphenyl	20	60-130	-
	4-Bromofluorobenzene	500	58-124	-
LCS	Diesel	250	60-130	25
	Gasoline	2.5	75-125	35

ATTACHMENT A

Quality Assurance Manual
STL San Francisco

STL San Francisco

1220 Quarry Lane
Pleasanton, California 94566

Quality Assurance Manual

Tenth Revision

January 2002

Prepared By:

Quality Assurance ________________________ Date: _______________
Jill Thomas

Approved By:

Laboratory Director: ________________________ Date: _______________
Eric Tam

Quality Assurance: ________________________ Date: _______________
Dennis Mayugba

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1.0 Introduction, Purpose, and Scope

1.1 Overview

STL San Francisco is a part of Severn Trent Laboratories, owned by Severn Trent Plc., a British water, waste, and utility services company. STL San Francisco is a full service environmental laboratory providing testing services for organic and inorganic analyses in a variety of matrices including soil, wastewater, ground water, hazardous wastes, drinking water and air. The laboratory is equipped with automated gas chromatographs using a variety of detectors, including photoionization, electron capture, flame ionization, and ELCD detectors. GC/MS analyses are performed on ten automated, computer-assisted spectrometers. Metals are analyzed using trace ICP, graphite furnace, AA and an automated mercury analyzer. PNAs and explosives are analyzed using a high performance liquid chromatograph. Laboratory functions are managed by ChromaLIMS, a unique Laboratory Information Management System. STL San Francisco specializes in providing the highest quality analytical testing and data deliverables with fast turn-around services.

STL San Francisco operates in compliance with the guidelines described under the STL Quality Management Plan, M-Q-001, Rev. 4, January 24, 2001.

1.2 Program Definition

Quality is defined as the degree to which a process or service meets or exceeds client requirements and expectations. Quality assurance constitutes those planned and systematic actions which, when carried out, provide adequate reliability of monitoring and measuring data. Quality control as a subset of quality assurance provides for the verification of implementation of the quality assurance system.

1.3 Quality Assurance Policy

The goal of STL San Francisco is to provide a positive environment in which there is a commitment to achieve an ever-improving standard of quality. This environment demands that processes and services including the methods employed to achieve quality be consistently improved.

STL San Francisco's policy is:

- To produce consistent and uniform quality analytical services that meet federal, state, and local regulatory requirements,
- To generate accurate, legally defensible data,

- To meet clients' requirements with the best professional services,
- To provide continuous evaluation and improvement of operational processes and procedures,
- To maintain a working environment that supports open communication with clients and staff.

1.4 Management Commitment to QA

Quality is a commitment, achieved by the desire for excellence and by continuous evaluation and improvement. Through this commitment, STL San Francisco follows a Quality Assurance program that involves every aspect of the laboratory and ensures highest quality sample analysis and highest quality data deliverables in the environmental testing industry.

STL San Francisco Mission Statement

STL San Francisco's mission is to provide the client with accurate, legally defensible test results at a reasonable cost.
We specialize in quick turnaround.

Severn Trent Laboratories' Mission Statement

We enable our customers to create safe and environmentally favorable policies and practices, by leading the market in scientific and consultancy services. We provide this support within a customer service framework that sets the standard to which others aspire. This is achieved by people whose professionalism and development is valued as the key to success and through continued investments in science and technology.

1.5 Purpose

The purpose of the Quality Assurance Plan is to provide a description of methods, responsibilities, and quality control systems associated with performing a variety of environmental analytical methods within STL San Francisco and to establish an effective quality management system which assures appropriate controls are implemented based on the complexity of analysis to be provided for each order submission. Roles and responsibilites of management and laboratory staff are also defined.

1.6 Scope

This Manual defines current quality principles and practices that apply to all aspects of the program and uses concepts and methods that have evolved through experience on environmental analytical methods. STL San Francisco follows the requirements as specified by regulatory agencies. Policies and practices set forth provide a baseline level performance standard. Specific project or client requirements may be used if they do not conflict with regulatory requirements.

2.0 Laboratory Organization and Responsibilities

This section describes the responsibilities for the Quality Assurance System. Each person involved in the generation of analytical data affects STL San Francisco's QA/QC Program. Responsibility of the staff for upholding the standards is described in the quality assurance manual and for implementing procedures is described in the laboratory standard operating procedures (SOPs).

2.1 Responsibility for the Quality Assurance System -

Overall responsibility for quality assurance lies with the Laboratory Director. Within the laboratory, the Laboratory Director is responsible for the implementation of the quality and technical requirements of laboratory analyses and services. The Quality Assurance department is responsible for monitoring the implementation of the QA system, and reporting audit and surveillance findings to management. The Quality Assurance Department, although an independent unit, reports laboratory quality issues directly to the Laboratory Director.

Employees of STL San Francisco are responsible for identifying, reporting, and documenting quality issues and performing the approved corrective action on deviations of laboratory technical and quality requirements.

2.2 Laboratory Director -

The Laboratory Director ensures that the operational requirements of the QA Manual are met. Other responsibilities include the following:

- Reviews and approves the Quality Assurance Manual.
- Manages the on-going requirements of the Quality Assurance and Quality Control activities through the QA Department.
- Has overall responsibility for the development and approval of SOP’s, QAP’s, and QAPP’s and assures that they are technically sound, correct, and meet regulatory requirements.
- Ensures appropriate corrective actions are taken to address non-conformance issues.
- Reviews and approves final data packages to clients.

2.3 Quality Assurance Department -

The Quality Assurance department reports directly to the Laboratory Director and is responsible for monitoring the quality assurance program in the laboratory. The effectiveness and objectivity of the QA/QC program depends on the Quality Assurance

Department being independent of the data-generating process. The primary responsibility of QA is to ensure that the laboratory is operating in compliance with the procedures defined by the EPA, other regulating agencies, and client organizations. This is accomplished through a process of internal audits, surveillances, corrective action, training, and in the development of procedures. The Quality Assurance Department has the authority to perform laboratory audits without notice, submit control samples (performance evaluation samples), and request access to data files and other information necessary to satisfy the goals of an audit. A QA/QC report to management is issued monthly which addresses ongoing QA/QC issues. Additionally, the Quality Assurance Department shall:

- Perform annual audits and periodic surveillances on laboratory activities.
- Coordinate the preparation of QC standards, inserting QC samples into the laboratory sample stream and analyzing resulting data.
- Perform statistical analyses utilizing results of QC sample results.
- Monitor the Quality Assurance program and assure its implementation.
- Provide QA support on quality related issues, including customer/regulatory audits, performance evaluation samples (PEs) and certification activities.
- Review and approve SOPs, QAPs, and QAPPs, to ensure they meet quality control requirements of this Quality Assurance Manual and other applicable quality requirements.
- Assure that a training program is in place and technical personnel have received training to perform their assigned tasks.
- Monitor implementation of laboratory certifications and contract requirements.
- Review 5% of the data produced per sample group for conformance.
- Perform QA training and orientation for laboratory personnel.

2.4 Laboratory Team Leaders -

Team Leaders have the responsibility for laboratory production. Team Leaders coordinate the Project Managers' and analysts' activities including data generation, project management and reporting results. In partnership with the Project Managers, they manage sample work flow to meet customer service objectives and assure that analysts carry out the Quality Assurance Program. Other responsibilities of Team Leaders are to:

- Routinely review and approve analytical reports.
- Identify training needs and recommend training programs for laboratory staff members.
- Train analysts to use methodologies described by approved SOPs.
- Maintain and distribute SOPs, QAP/QAPPs.

- Ensure compliance with approved SOPs, QAP/QAPPs, and quality control.
- Assist analysts in correcting non-conformance issues and reporting them to the Laboratory Director and QA.
- Implement laboratory QA/QC program and participate in determining corrective actions for out-of-control situations.
- Assure compliance with Company Health and Safety program and administer company personnel policies.
- Manage all administrative functions of the laboratory.
- Participate in management teams that plan and problem solve.

2.5 Project Manager -

A Project Manager oversees assigned projects and ensures that all performance requirements are met according to the agreed scope of work. A Project Manager is also responsible for the following:

- Reviewing and approving laboratory data reports and verifying compliance with project requirements.
- Acting as the primary point-of-contact for the client with the laboratory.
- Assuring prompt implementation of project requirements.
- Reviewing specific client requirements and relating these requirements to the laboratory personnel.
- Monitoring samples from receipt through analysis to verifying that proper handling, analysis, and turn-around-time requirements are being met. This includes assuring that hold times are met.
- Coordinating changes in requests.
- Reviewing log-in reports for accuracy and completeness and resolving discrepancies in samples received.
- Providing laboratory management with periodic status reports regarding assigned projects.
- In the final step of document generation, insures that all final data packages are issued to the client complete and on time.

2.6 Analyst -

An analyst produces laboratory test results while following analytical and QC protocol outlined in approved SOPs, QAP/QAPPs. Analysts are responsible for the following:

- Producing quality laboratory data on time. This includes meeting EPA recommended hold times.
- Reviewing of QC data for each batch of samples produced.
- Meeting project data objectives and production goals.
- Performing peer review of raw data.
- Maintaining instruments.
- Correcting non-conformance issues as approved by management.
- Suggesting improvements in methodologies.

2.7 Health & Safety Officer -

The Health & Safety Officer coordinates and oversees the Health & Safety (H&S) Program.

- Presides over H & S issues.
- Together with the Safety Committee, provides H & S training and orientation.
- Together with the Safety Committee, performs H & S inspection/audits of laboratory activities.
- Coordinates with consultant on developing and maintaining laboratory Chemical Hygiene Plan and provides training for the laboratory personnel on Chemical Hygiene.
- Chairs monthly H & S committee meetings.
- Documents all accidents, inspections, and training.
- Inspects all safety equipment and provides safety equipment, goggles, masks, and any other required equipment.

Figure 2-1

STL San Francisco Organization Chart

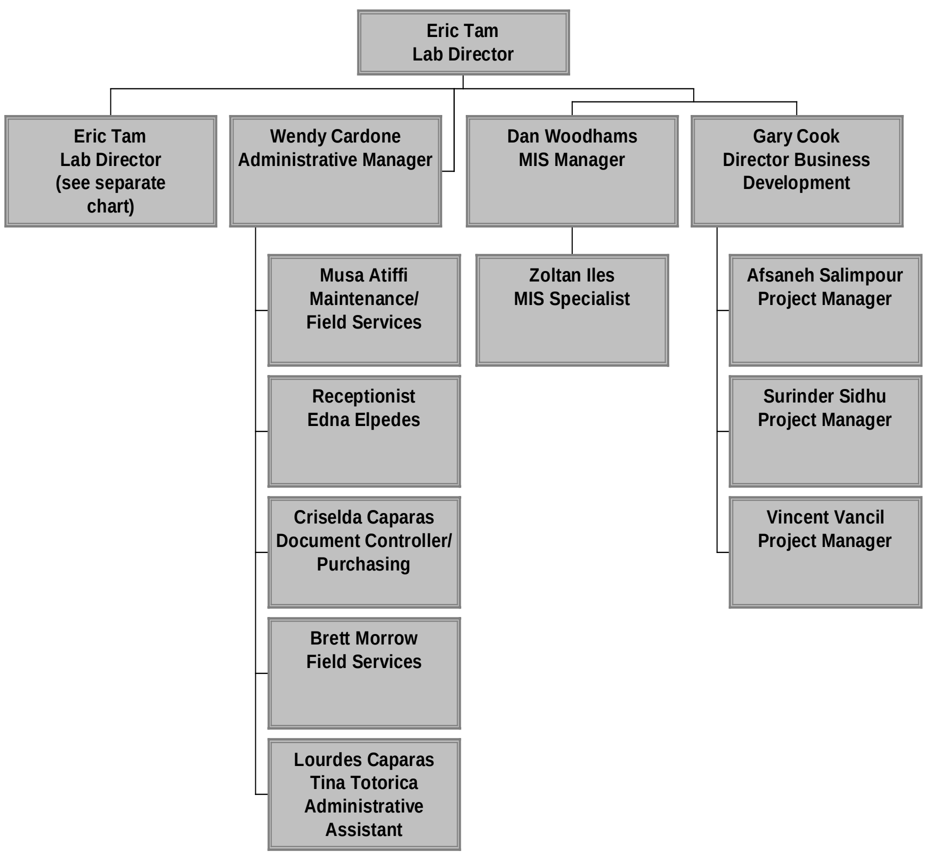
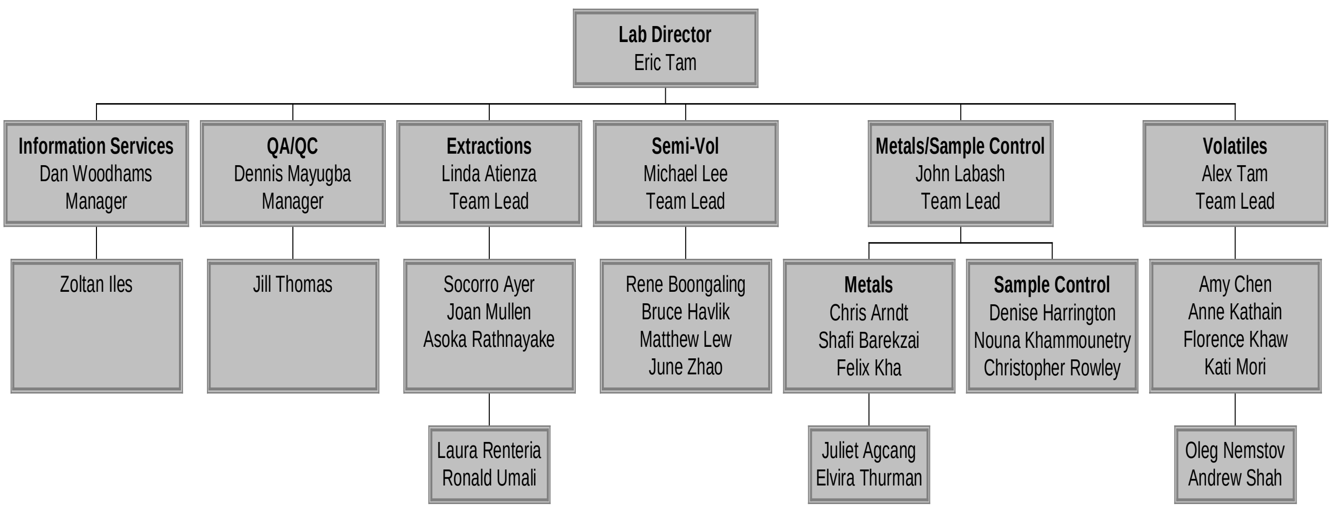


Figure 2-2

Organization Chart Cont.



3.0 Quality Management

3.1 Overview of the Quality Assurance Program -

STL San Francisco's Quality Objective is to provide technically sound and legally defensible data for its customers. To accomplish this objective, STL San Francisco has developed and implemented a comprehensive Quality Assurance program that provides the framework in which all analytical procedures in the laboratory are performed. STL San Francisco has dedicated both the financial and human resources it deems necessary to fully accomplish its Quality Assurance objective.

STL San Francisco's Quality Assurance program is built around three core elements:

1) A written **Quality Assurance Manual (QAM)** describing its capabilities, quality assurance objectives, the systems for meeting those objectives, and the mechanisms for continuously updating and improving those systems. In addition, Quality Assurance Project Plans (QAPP) are developed for specific project or client needs.

2) Written **Standard Operating Procedures (SOPs)** for all aspects of its operations, including instrumentation, analytical procedures, data management and administrative systems.

3) A consistent **Quality Control (QC)** program which includes analysis of blanks, spikes, duplicates, second-source calibration verification standards and other procedures, to assure that no data is reported without meeting all QC requirements mandated by regulatory agencies, clients and STL San Francisco’s QC standards. An integral part of the QC program is routine participation in various Performance Evaluation (PE) sample programs, including the EPA mandated WS, WP, and hazardous waste programs.

3.1.1 Quality Assurance Plan

STL San Francisco’s Quality Assurance Manual (QAM) was developed to be responsive to requirements and guidelines identified in EPA QA/R2, July, 1993 and SW 846, Chapter 1, Rev.1, July, 1992. The QAM is a controlled document distributed to assigned laboratory personnel in designated positions who perform analytical procedures, supervise those who do, or are responsible for implementing laboratory quality assurance requirements.

The QAM is revised periodically to maintain its relevancy and applicability. In addition, individual sections or pages are added or replaced throughout the year to maintain a current, complete working document. The methods of control are discussed in Section 7.0, “Document Control & Distribution” and in STL San Francisco SOPs Section 12.13.

3.1.2 Standard Operating Procedures

Written Standard Operating Procedures (SOPs) are developed and used throughout the laboratory. They establish the specific requirements necessary to perform various quality affecting activities and to ensure the consistent performance and resulting data meet the established standard. SOPs are reviewed periodically for continued applicability and are revised as needed. Bench analysts have working copies of all SOPs relevant to their work assignments that serve as training and reference documents.

SOPs are written by the appropriate managers and follow a standard format. After initial drafting, SOPs go through several levels of review before final approval by the Laboratory Director and Quality Assurance. Newly developed SOPs and revisions of existing SOPs receive final approval by the Laboratory Director, Technical Reviewer and Quality Assurance as described in SOP #1.00.

STL San Francisco's SOPs direct the analytical procedures as performed at the bench. No modifications are allowed without complete documentation and approval of the Laboratory Director, Technical Reviewer and Quality Assurance. Should a method modification be necessary, an approval process is established that assures that technical acceptability and client needs are maintained. SOP #1.00 describes the process by which a standard operating procedure is initiated or revised.

3.1.3 Quality Control Program

STL San Francisco maintains a uniform, comprehensive Quality Control program to assure that all analytical data reported is a consistent, known quality that fully meet the requirements of regulatory agencies, clients and STL San Francisco's quality standards.

STL San Francisco's QC program was developed to diagnose and correct out-of-control situations and prevent their reoccurrence. Corrective action for out-of-control situations are identified in the SOPs.

The key elements of STL San Francisco's QC program include:

- **Method Blanks** - to monitor the level of contamination in the analytical process which could lead to reporting of false positives;

- **Laboratory Control Standards (LCS/LCSD)** - to monitor the accuracy (% recovery) and precision (LCSD) of the entire analytical procedure for analytes;
- **Surrogate Standards** - to monitor the recovery of organic compounds that are chemically similar to analyte compounds in order to assess the performance of the analytical system from sample to sample.
- **Matrix Spikes** - to monitor the recovery of known amounts of the analyte compounds to assess the effect of matrix interferences on the accuracy of the analysis;
- **Matrix Spike Duplicates** - to monitor the recovery of known amounts of analyte compounds from separate aliquots of the same sample to assess the effect of matrix interferences on the accuracy and precision of the analysis;
- **Duplicates** - to monitor the recovery of native levels of analyte compounds from separate aliquots of the same sample to monitor the precision of the analysis;
- **Standard Additions** - to correct for matrix effects on the accuracy of analysis by adding a series of known amounts of analytes to the sample (usually for metals or other inorganic compounds);
- **Trip and Field Blanks** - to provide additional QC procedures to monitor contamination introduced during sample collection, transport, or storage.

3.2 Analytical Procedures -

Analytical and other laboratory procedures used by STL San Francisco are described in its STANDARD OPERATING PROCEDURE (SOP) manual which details the proper handling and reporting of samples, performance of analytical and laboratory procedures, proper sample disposal, and safety practices. Reference is made to methods developed by EPA, Standard Methods, instrument manufacturers, and other agencies.

STL San Francisco derives its analytical methods from the following sources:

- "Test Procedures for Analysis of Organic Pollutants", **CODE OF FEDERAL REGULATIONS**, 40 CFR Section 136, Appendix A, B, C, July, 1996 edition: Organics in water EPA Methods 608, 624, 625, and 200.7.
- **METHODS OF CHEMICAL ANALYSIS OF WATER AND WASTE, EPA - 600/4-79-020, USEPA EMSL**, Cincinnati, OH, Revised, March 1983, including Method 300.0, EPA-600/4-84-017, March, 1984: Metals in water, inorganic parameters, oil and grease, and petroleum hydrocarbons.
- **TEST METHODS FOR EVALUATING SOLID WASTE**, SW-846, 3rd edition, USEPA OSW, Washington, D.C., November, 1986, including Update III, December 1996: Metals

and organics in soils and mobility extracts; metals and organics in groundwater for RCRA compliance; hazardous material characterization.

- **STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER**, 18th edition, American Public Health Association, 1992: Pesticides, wet chemistry, and petroleum hydrocarbons in waters, soils, and sludges.
- **METHODS FOR THE DETERMINATION OF ORGANIC COMPOUNDS IN FINISHED DRINKING WATER AND RAW SOURCE WATER,** USEPA EMSL, Cincinnati, OH, September, 1986: Organics in water (drinking water).
- **LEAKING UNDERGROUND FUEL TANK (LUFT) MANUAL**, State of California Water Resources Control Board, August, 1990: Organics, TPH by gas chromatography, and toxics in soil and groundwater.
- **HANDBOOK FOR ANALYTICAL QUALITY CONTROL IN WATER AND WASTEWATER LABORATORIES**, EPA-600/4-79-019, USEPA EMSL, Cincinnati, OH, March, 1979: Laboratory QA/QC practices.
- **CALIFORNIA CODE OF REGULATIONS,** Title 22, Div. 4: Environmental Health, Department of General Services, State of California.
- **FEDERAL REGISTER**, June 29, 1990, 40 CFR Part 261, Appendix II: TCLP.
- **Instruction and operating manuals** of various instrument manufacturers.

STL San Francisco has established Reporting Limits (RLs) for all analyses it performs. These RLs are identified in Section 4 of this document.

3.3 LIMS

STL San Francisco's **Laboratory Information Management System (LIMS)** is the heart of the QA management program, stores information about all samples and requested analysis. It provides the possibility of a nearly paperless system for the management of all sample data in the laboratory.

3.3.1 Samples are logged into ChromaLIMS on arrival (barcode sample tracking on the container level). ChromaLIMS creates an Internal Chain of Custody (ICOC), tracks work scheduling and deadlines, provides automated preparation and run logs, receives results directly from instruments, and prepares reports with full QC documentation. Reports are automatically validated by LIMS against established criteria. Electronic data reporting is routinely available in various custom and standard formats. Database information is under strict security.

3.3.2 ChromaLIMS is used continuously by bench and management personnel as their information base for assuring the quality, timeliness and defensibility of all analytical data. ChromaLIMS meets all proposed Federal standards for auditability and accountability.

3.4 Quality Assurance Support Programs -

To assure the full performance of its quality assurance programs STL San Francisco maintains on-site technical and administrative support. These are managed by the Laboratory Director and monitored or implemented by the Quality Assurance Department.

3.4.1 STL San Francisco maintains a **Preventive Maintenance (PM)** program to assure timely, cost-effective care and maintenance of all instruments and equipment. The goal of the PM program is the maximization of the operating time for each instrument and the prevention of catastrophic instrument failures. Responsibility for the PM programs rests with department team members (Section 5.3).

3.4.2 Technical Review is conducted on data generated in the laboratory to assure that all requirements have been met. The review is conducted following the analyst's calculation and review of results, but before the data is presented for final review and approval. Reviewing analysts are trained in the data review process and must have demonstrated competency to perform that analysis before they perform data reviews. Following review of acceptable data the reviewer initials all reviewed data (Section 10.0).

3.4.3 Training and Development Programs are discussed in Section 8.0.

3.4.4 Health and Safety (H & S) programs are discussed in Section 3.0.

3.4.5 Audits are discussed in Section 11.0.

3.5 A written **Quality Assurance Report to Management** is issued monthly and includes the following:

1) Corrective actions implemented as a result of audit or performance evaluation sample deficiencies.

2) Completed and scheduled audits and the distribution of performance evaluation samples.

3) An account of the corrective action reports issued and the actions and resolutions taken.

4) LIMS status.

5) QA/QC training.

6) Systemic problems and action and resolution taken.

7) Quality achievements.

3.6 Quality Control Meetings -

Quality Control meetings will be held as needed or as required by clients. Orientation to new contracts, assessment of required personnel and equipment, methods, and training will be discussed. These meetings will include the QA Department, Laboratory Director, and Team Leaders. Others may attend these meetings when deemed necessary.

4.0 Laboratory Analytical Activities and Controls

4.1 Sample Custody -

When samples arrive at the laboratory they will be accompanied by **a Chain-of-Custody.** The Chain-of-Custody is a legal document that is rigorously maintained to provide traceability of the samples from their original source to their final disposal. When transferring the possession of samples, the individuals relinquishing and receiving the samples shall sign, date, and note the time on the Chain-of-Custody. The Chain-of-Custody documents all transfers of custody of samples.

The Chain-of-Custody will include date of sampling, sampler, date and time of arrival at the laboratory, who received it, sample ID, preservation, analyses required, matrix, client's project manager, project number, sample location and special requirements (such as turnaround time). It is important that the Chain-of-Custody is correct. Changes after sample receipt will require corrective action and the corrected Chain-of-Custody must be signed and dated by the client before analyses may begin.

Laboratory personnel will be responsible for the care and custody of samples upon receipt by the laboratory. This care and custody responsibility also extends to any samples submitted, but placed on analytical hold for possible future analysis.

4.1.1 Sample Reception.

The designated Sample Controller at the laboratory will accept custody of all samples. The Controller will inspect the sample containers for leakage, breakage or other damage, and verify that the sample identification numbers on the bottles match those on the Chain-of-Custody. The Chain-of-Custody will be signed and dated, an STL San Francisco reference number placed on the form, and a copy immediately returned to the client or other designated party. If samples are received without proper preservation or samples' temperatures are elevated or other discrepancies are noted, they will be documented on the Chain-of-Custody and sample receipt checklist. The project manager will also be immediately notified in order to contact clients who must schedule resampling or take other corrective action.

4.1.2 Sample Log-in.

ChromaLIMS is a unique data management system in which sample login is a significant component for the successful tracking and reporting of client projects. As a sample group is logged into LIMS, it will be assigned a unique STL San Francisco submission ID number, and each container will be assigned its own tracking number. This tracking number is automatically printed on the container label in barcode format along with other pertinent data, such as client name, client sample ID, analysis required etc. This will initiate an electronic internal chain-of-custody (ICOC). LIMS will keep track of all due dates and holding times and will audit all changes that will be made to the sample records during the laboratory workflow. Project Managers and all lab personnel have access to this information on a view/read only form.

Upon login the samples will be refrigerated in the absence of light and analyzed within the hold times designated for the indicated analyses. A job jacket file will be prepared for each project/submission that includes the original Chain-of-Custody, sample shipping papers, and other project documentation. The job jacket will be given to the Project Manger for review and approval.

4.1.3 Sample Security.

Following log-in, all samples (except aqueous metals) will be stored while awaiting analyses in designated locked refrigerators. Aqueous samples requiring metals analyses (except hexavalent chrome and organo lead) will be stored in locked cabinets at room temperature. Access will be limited to the Sample Controller and designated analysts who record all sample movements on sample custody sheets (Refer to SOP #2.03).

4.1.4 Sample Tracking.

Samples, when taken from storage for analysis, are tracked by scanning the container barcode. This scan will relinquish custody of the sample to the chemist/department. Within each department, samples are logged into the appropriate instrument or procedure sample log books by identification number, due date, matrix and analysis requested. Following analysis, samples are again scanned when returned to sample control. Laboratory personnel will be responsible for the care and custody of samples from the time they are received until they are depleted during analyses, no longer suitable for analysis, or as otherwise directed by the Project Manager or by laboratory sample disposal policy.

4.2 Sample Preparation and Analysis

Once samples are received within a department, they will be logged as described under the section “Sample Tracking” and will be prepared according to the method SOP. A prep batch will be created in LIMS based on the ICOC.

When sample preparation is complete, the prep batch will be relinquished to the analyst who must sign for them either electronically or manually. The analyst will create instrument sequences based on the prep batches by simply referring to the prep batch. For methods without a preparation (example, volatiles), the anlayst will select the samples to be analyzed from LIMS and the sequence file editor creates sequence records for each sample selected.

4.3 Data Reduction, Validation, and Reporting.

4.3.1 Data Reduction.

Data reduction is the process by which raw data is converted into reportable results. It may be either automated or manual.

- **Automated Data Reduction.** Most data produced at STL San Francisco is computer generated from the various analytical instruments and automatically acquired by the LIMS. The analyst is responsible for verifying the integrity of the raw results both before and after the data has been acquired by LIMS. Any editorial changes are documented in LIMS and stored in its "audit trail".

- **Manual Data Reduction.** For non-computerized analyses, particularly those used in many Wet chemistry tests, information is manually entered into LIMS. LIMS calculates results which are reviewed by the analyst. Any calculations made are shown in the analyst's bench workbook.

  Systems performance checks and audits will be performed periodically to verify that all automated instrument and LIMS software programs are performing properly.

4.3.2 Data Validation.

The analyst will be responsible for determining whether the analytical run is in control and will be expected to review all calibration standards, calibration verification standards, LCS, blanks, spikes and duplicates. To be in control both the LCS and RPD must fall within established control limits. If both fall outside the control limits, the entire batch must be re-prepared and rerun. If either the LCS or the RPD, but not both, fall outside control limits, but the MS/MSD are in control, the data may be reportable upon further review.

Quality control checks for specific analyses will be based on EPA performance criteria. If there is a method specified control limit, it is used unless actual laboratory performance supports a more rigorous limit.

Outliers. An outlier is a data point that is not representative of the data set and that falls outside established control limits. If an outlier is suspected, data results are first checked for an assignable cause such as instrumental or computational errors, contamination, or misidentification. If such an error is found and corrective action brings the data point into control then, generally, the data will be reportable. The corrective action will be fully documented.

STL San Francisco SOPs 12.02.01 & 12.02.02 describe the procedures for determining outliers (out of control data points).

Reporting Limit Multipliers. Matrix interferences and/or high analyte concentrations may necessitate higher reported detection limits.

- If dilutions are made due to a high concentration level of one or more analytes, but the instrument can still see above the interferences at the regular reporting limit level, the reporting limit(s) will remain the same and will not be raised.

- When a dilution must be made due to matrix interferences and the instrument cannot detect the analyte(s) at the regular reporting limit level, then the reporting limit will be raised.

4.3.3 Data Reporting.

Reporting is the process of communicating approved test results to a client. STL San Francisco has established three levels of reporting which differ only in the level of QA/QC data included in the report package. The quality of analytical results is the same in all three reporting levels.

An automatic data validation process is performed for all reports generated by ChromaLIMS based on laboratory and regulatory criteria such as: meeting QC sample requirements, using appropriate qualifiers, reporting all requested compounds, checking consistency of QC batches etc… Results of this validation are presented in all levels of review for corrective action if necessary.

- **Standard STL San Francisco Report includes:**

  Cover letter

  Chain-of-Custody.

  General Project Information: Sample and client information, sampling date, submission date, extraction and analytical dates, method used, sample results in dry weight or wet weight, dilution factors, reporting limits.

  Detailed results of the method blank.

Matrix spike results and recoveries (accuracy) – if analyzed on client's sample.

Matrix spike duplicate results and recoveries (precision) – if analyzed on client's sample.

Precision and accuracy control limits.

Laboratory Control Sample (LCS) results.

Laboratory Control Sample Duplicate (LCSD), if applicable.

Surrogate recoveries (if applicable).

Statement page of conformance or non-conformance issues signed by the Project Manager or qualified representative.

- **Level III Report** includes all items in Standard Report, plus:

Case Narrative.

Table of Contents.

Method Summary.

Original copies of cooler receipt forms along with the chain-of-custody and sample receipt check list, if applicable.

Copies of GC fingerprint chromatograms, preparation logs, run logs, and other analytical data as required.

QC reports.

Initial and continuing calibration summaries and chromatograms.

Supporting Data – GC fingerprint chromatograms and inorganic chemistry raw Data. Inorganic chemistry raw data.

Preparation & Instrument analysis logs.

GC retention time table for PCBs & pesticides.

Sample preparation logs and run sequences and logs with injection times. ICAL and CCV data is included.

- **Level IV Report** includes all items in Standard Report & Level III plus:

Copies of all raw data sheets including reruns, dilutions, QA/QC results, confirmation runs, chromatograms and quantitation report, and tuning and mass calibration report for GC/MS.

Initial and continuing calibration to include Response Factor, Retention Times, QA/QC.

Retention time windows for GC, when applicable.

Injection records.

For metals - interference check sample, Method of Standard Additions, serial dilutions, linear ranges, interelement correction factors.

4.4 Laboratory Information Management System (LIMS)

STL San Francisco's Laboratory Information Management System maintains all sample and report-related information at STL San Francisco. Samples arriving will be logged into ChromaLIMS which:

1) Tracks work scheduling and due dates, holding times,
2) Generates instrument sequences, electronic prep and run logbooks with full QC eliminating typos.
3) Records weights directly from the analytical balance,
4) Receives results directly from instruments,
5) Audits bench review, second level approval,
6) Provides electronic validation for bench chemist and Project Management for final approval,
7) Prepares reports with full QC documentation.
8) Electronic data reporting is available in multiple custom and standard formats.
9) All Reports are created in Adobe Acrobat PDF file format and can be delivered from within LIMS by email or fax by a click of mouse…or can be printed.
10) STL San Francisco's LIMS meets all current Federal standards for audit ability and accountability.

4.5 Internal Quality Control Checks.

STL San Francisco maintains a comprehensive program of field and laboratory QC procedures.

Field QA/QC samples may be periodically prepared in the field and submitted for analysis with the regular samples upon client's request. These QA/QC samples will consist of field equipment blanks, travel blanks and replicate samples. QA/QC samples may be given fictitious sample designations. They shall be handled and transported in the same manner as regular samples.

Depending upon project objectives, field travel blanks may be prepared in the field for every organic sampling event using laboratory-grade organic free water. If prepared by customer or field samplers, the field travel blank will be poured into a bottle at one of the sampling sites, and so noted on the field sampling form. The field travel blank will be analyzed for the complete set of organic parameters requested for the regular samples. Laboratory travel blanks will be prepared in the same way in the laboratory, and travel with containers to the field and back again for analysis. The laboratory travel blank will be analyzed for the complete set of volatile organic parameters requested for the regular samples.

Depending on project objectives, one replicate sample may be collected for every sampling event and submitted for analysis. The replicate will be analyzed for the complete set of parameters requested for the regular sample.

Laboratory Quality Control Tests. In addition to the field QA/QC samples described above, the laboratory will analyze, at a minimum, the following QA/QC samples:

Method Blanks at a frequency of one every 20 samples to monitor laboratory contamination.

Laboratory Control Sample (LCS) at a frequency of one every 20 samples to monitor accuracy of system and preparation. The DI water or clean sand will be spiked prior to extraction, and the results reported as percent recovery.

Laboratory Control Sample Duplicate (LCSD) at a frequency of one every 20 samples to monitor accuracy and precision. LCSD is optional if an MSD is analyzed for the same analytical batch to monitor precision.

Matrix Spikes at a frequency of one every 20 samples to monitor accuracy. The sample will be spiked prior to extraction and the results reported as percent recovery.

Matrix Spike Duplicate at a frequency of one every 20 samples to monitor accuracy and precision. The same sample that was used as a matrix spike will be spiked a second time prior to extraction. The results will be reported as percent recovery.

Sample Duplicates at a frequency of one every 20 samples to monitor precision. (A matrix duplicate is run only upon request by client.)

CCV & CCB, continuing calibration verifications (CCVs) are run at a minimum of one every 12 hours for organic analyses (GC and GC/MS). STL San Francisco follows the guidelines set forth in SW 846, Method 8000B. Continuing calibration blanks, CCBs, (requirement for metals analyses) and CCVs are run at a frequency of one every ten injections for metals analyses.

Surrogate Spikes are run on 100% of organic samples when required per STL San Francisco SOP.

An ICP Interference Check Sample is run at the beginning and end of each ICP analytical run.

The laboratory will maintain on file all laboratory QA/QC documentation, reviewed for completeness. The following administrative QA/QC will be performed:

The dates of sample extraction and analysis will be compared with sample collection dates to ensure that the samples were analyzed within EPA established holding times;

The respective sets of values from duplicate QC samples will be compared for agreement. Results from identified field blanks will be reviewed. Reanalysis will be performed as necessary;

All required quality control samples will be run daily to monitor system performance. If quality control samples indicate a problem with the system, the analyst will evaluate the procedure to determine the source of error. If a repetition of the QC sample does not fall within acceptable limits, the instructions for corrective action in out-of-control situations will be followed;

When required by the method, all positive organics results will be confirmed using a second column or by GC/MS;

Logbooks will be maintained for preparation of all organic and inorganic standards. Information on suppliers, lot numbers, weight/volume of standards used, date prepared, expiration date, and name of analyst will be recorded.

4.6 QA Objectives for Measurement Data -

STL San Francisco maintains a data quality program to ensure that it meets the requirements of its clients for data quality. STL San Francisco's data quality is expressed in terms of precision, accuracy, representativeness, completeness, and comparability.

Precision. The laboratory objective for precision is to equal or exceed the precision demonstrated for given analytical methods as published by the U.S. EPA. Precision is defined as the degree of reproducibility of the measurements under a given set of conditions. Precision will be documented on the basis of replicate analyses.

Accuracy. The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for given analytical methods and to perform better than the recovery data published by the U.S. EPA. Accuracy is defined as the bias in a measurement system. Accuracy will be documented on the basis of recovery of blank spikes. matrix spikes, and spiked reference materials introduced into selected samples of a particular matrix.

Representativeness. The laboratory objective for representativeness is to provide data which is representative of the sampled medium. Representativeness is defined as the degree to which data represent a characteristic of a set of samples. The representativeness of the analytical data is a function of the procedures and care used in processing the samples. The representativeness will be documented by the difference between separately procured, but otherwise identical samples or sample aliquots.

Completeness. The completeness objective for an analysis is to provide sufficient data of acceptable quality such that the goals of the analytical project can be achieved within the time frame required. The overall project completeness will be expressed as the percentage of qualified data for the entire project.

Comparability. The comparability objective is to provide analytical data for which the accuracy, precision, representativeness, completeness and detection limit are similar to these quality indicators for data generated by other laboratories for similar samples, and for data generated by STL San Francisco over time. The comparability objective will be documented by interlaboratory studies carried out by regulatory agencies or carried out for specific projects or contracts, and by comparison of periodically generated statements of accuracy, precision and detection limits.

4.7 Assessment Procedures for Data Acceptability -

Assessment of data acceptability will be performed primarily by establishing acceptance limits for precision and accuracy through the use of control charts. Reference is made to other sections of this document which discuss related topics, including Section 4.6 on quality assurance objectives, Sections 4.3.1 & 4.3.2 on data reduction, and Section 4.5 on internal quality control checks.

(1) Precision will be assessed at the bench based on the results of paired spiked samples or, where spikes are not feasible, duplicate samples. The analyst calculates the relative percent difference (RPD) according to the following formula:

$$RPD = \frac{D1 - D2}{(D1 + D2)/2} \times 100$$

where,
RPD equals the absolute difference between duplicates, D1 and D2, divided by the mean of the duplicate results.

The result of the calculation will then be compared to the method-specific control limits found in Table II of this document.

If the comparison reveals precision to be outside acceptance windows, the analyst will undertake corrective action as described in Section 6.0 of this document.

In some instances, insufficient sample is provided for use as duplicates or matrix spike duplicates. In this situation, in order to provide a precision assessment for such batches, two Laboratory Control Standards (LCSs) will be prepared and analyzed. The RPD will be calculated as for matrix spikes. While not as indicative as a matrix spike would be, this procedure still provides valuable QC information for the samples in the batch.

(2) **Accuracy.** Method accuracy assesses the short-term control status of the analytical process. LCSs are used to provide this assessment. Matrix spikes assess matrix accuracy. Percent recovery (R) will be calculated according to the following formula and compared with the method limits from the QC limits shown in Table II of this document. Results outside control limits will require corrective action as described in Section 6.

$$R = \frac{\left| SSR - SR \right|}{SA} \times 100$$

where,
R = % Recovery
SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Amount/Conc.

Control Charts will be routinely plotted and instrumental performance, contamination, and analytical error trends will be monitored. The control limit for accuracy is $\pm$ three standard deviations from the mean percent recovery. The warning limit is $\pm$ two standard deviations.

Control limits will be recalculated at least annually. When acceptable control limits have been achieved and calculations completed, the QA Department will review and distribute control limit lists and control charts for use by the analysts. All revisions to control limits will be entered into LIMS and become the new quality control limits of the laboratory.

4.8 Reporting Limit Criteria -

Method Detection Limit (MDL): The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte. STL San Francisco SOP #12.03.01 describes the procedures for determining MDLs for various analytes. MDLs will be performed yearly per method per matrix per analyte. Any relevant change in methodology will require a satisfactory MDL study before it can be accepted. In the case that typical MDLs are listed in published methods (e.g. SW-846), they should be regarded as baseline values. STL San Francisco's experimentally determined MDLs will meet or be below the listed MDLs. If these typical MDLs cannot be achieved, it will be brought to the attention of the QA department immediately. All MDL files will be maintained within the QA department.

Instrument Detection Limit (IDL): The minimum concentration that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a known standard solution. STL San Francisco SOP #12.03.02 describes the procedures for determining IDLs for various analytes. As a minimum, IDLs will be performed before a new instrument is used for production work. Furthermore, any modification of the instrument that may affect its sensitivity (e.g. new detector) will also require an IDL study.

Practical or Estimated Quantitation Limit (PQL/EQL): The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The EQL is generally 5 to 10 times the MDL. However, it may be nominally chosen within these guidelines to simplify data reporting. For many analytes, the EQL analyte concentration is selected as the lowest non-zero standard in the calibration curve (10X MDL).

Reporting Limit: The lowest concentration that can be reliably achieved for a specific analyte. taking into account of various variables such as dilution and matrix interference. The reporting limit will be the same as or higher than the experimentally determined MDL for the same matrix.

- In cases where samples are diluted, the dilution factor will be applied to the PQL/EQL, **not** the MDL.
- Individual SOPs will address instances where published limits are not practical to achieve.

4.9 Communication of Project Requirements -

Project-specific requirements will be communicated to laboratory personnel in one or more of four procedures, whichever are appropriate:

- One time: Requirements are described in comments in LIMS, and copies of the COC are distributed to affected laboratory personnel.
- Project-specific, short-term: Requirements are described in comments in LIMS, plus a memo written by the Project Manager is distributed to affected personnel.
- Project-specific, long-term: A special project description is created in LIMS, e.g. client specific methods, reporting requirements, test and analyte lists.
- Quality Assurance Project Plan (QAPP), long-term: This occurs when work is performed under different QAPP's. A project "kickoff" meeting is held during which new QA requirements are communicated to section leaders. A summary of QAPP requirements are written by the Project Manager in a form suitable for bench chemist' use. Each QAPP is referenced by site name. When work comes in, the Project Manager describes the data package requirements for each COC by level number (e.g. Standard Report, III, or IV). The "site" designation is assigned for each QAPP as specified by the client.

Table I

Sampling Guide and Holding Times for Solids, Water and Wastewater

Parameters	Hazardous Waste Method Soil & Water	Wastewater/ Water Method	Container Type Solids	Container Type Liquids	Preservative Liquid	Holding Time
CLASSIC CHEMISTRY						
ALKALINITY	***	310.1, SM 2320B	***	500 mL HDPE	None Required	14 Days
AMMONIA	***	350, SM 4500	***	500 mL HDPE	pH<2 H_2S0_4, 4°C	28 Days
BIOCHEMICAL, OXYGEN DEMAND (BOD)	***	SM 5210B	***	1 L HDPE	Cool 4°C	48 Hours
BROMIDE	***	300.0	***	500 mL HDPE	None Required	28 Days
CHLORIDE	***	300.0	***	500 mL HDPE	None Required	28 Days
CHEMICAL OXYGEN DEMAND (COD)	***	410, SM 5520	***	500 mL HDPE	pH<2 H_2S0_4, 4°C	28 Days
COLIFORM, HTP	9131, 9132	SM 9221	***	SPC	(1) 4°C	6 Hours
CYANIDE	9010	335, SM 4500	4 oz CWM	500 ml HDPE	(2) pH>12 NaOH, 4 °C	14 Days
FLUORIDE	***	300.0	***	500 mL HDPE	None Required	28 Days
KJELDAHL NITROGEN, TOTAL (TKN)	***	351, SM 4500	***	500 mL HDPE	pH<2 H_2S0_4, 4°C	28 Days
MBAS	***	425.1, SM 5540C	***	500 mL HDPE	Cool 4°C	48 Hours
NITRATE	***	300.0	***	500 mL HDPE	Cool 4°C	48 Hours
NITRITE	***	300.0	***	500 mL HDPE	Cool 4°C	48 Hours
OIL & GREASE	1664	SM 5520B, 413.1	4 oz CWM	1 L A.J.	pH<2 H_2S0_4 or HCl, 4°C	28 Days
pH	9040, 9045	150.1, SM 4500	4 oz CWM	500 mL HDPE	None Required	Anal. Immed.
PETROLEUM HYDROCARBONS (TRPH)	1664	418.1	4 oz CWM	1 L Glass	pH<2 HCl, 4°C	28 Days
PHOSPHORUS, ORTHO	***	300.0	***	500 mL HDPE	Cool 4°C	48 Hours
PHOSPHORUS, TOTAL	***	365, SM 4500	***	500 mL HDPE	pH<2 H_2S0_4, 4°C	28 Days
RESIDUE, TOTAL	***	160.3, SM 2540B	***	500 mL HDPE	Cool 4°C	7 Days
RESIDUE, FILTERABLE (TDS)	***	160.1, SM 2540C	***	500 mL HDPE	Cool 4°C	7 Days
RESIDUE, NON-FILTERABLE (TSS)	***	160.2, SM 2540D	***	500 mL HDPE	Cool 4°C	7 Days
RESIDUE, SETTLEABLE	***	160.5, SM 2540F	***	2 1/2 L A.J.	Cool 4°C	48 Hour
SPECIFIC CONDUCTANCE	9050A	120.1, SM 2510B	***	500 mL HDPE	Cool 4°C	28 Days
SULFATE	***	300.0	***	500 mL HDPE	Cool 4°C	28 Days
SULFIDE	9030	376, SM 4500	4 oz CWM	500 mL HDPE	(3) pH>9 NaOH, ZnOAc, 4 °C	7 Days
TOTALORGANIC CARBON (TOC)	9060	415.1, SM 5310	4 oz CWM	500 mL HDPE	pH<2 H_2S0_4, 4°C	28 Days
METALS						
CHROMIUM VI	7196	SM 3500-Cr D	4 oz CWM	500 mL HDPE	Cool 4°C	W-24 Hours
MERCURY	7470, 7471	245.2	4 oz CWM	250 mL HDPE	pH<2 HNO_3	28 Days
METALS (Except Cr^{+6} & Hg)	6010 / 7000 Series	200.7/200 Series	4 oz CWM	250 mL HDPE	pH<2 HNO_3	6 Months
VOLATILE ORGANICS						
METHANE, CO_2	3810M		***	x3 - 40 ml VOA	Cool 4°C	30 Days
PURGEABLE AROMATICS	8020, 8021	602	4 oz CWM	x3 - 40 ml VOA	(1) pH<2 HCl,4°C	14 Days
PURGEABLE HALOCARBONS	8021, 8260	601	4 oz CWM	x3 - 40 ml VOA	(1) pH<2 HCl,4°C	14 Days
VOLATILE ORGANICS, FUEL OXYGENATES	8260	624	4 oz CWM	x3 - 40 ml VOA	(1) pH<2 HCl,4°C	14 Days
SEMI-VOLATILE ORGANICS						
PCB'S	8082	608	8oz CWM	1 L A.J.	Cool 4°C	S-14 Days, W-7 Days (4)
PESTICIDES, CHLORINATED	8081	608	8oz CWM	1 L A.J.	(1) pH-5-9, 4°C	S-14 Days, W-7 Days (4)
PHENOLS	8270	625	8oz CWM	1 L A.J.	(1) 4°C	S-14 Days, W-7 Days (4)
POLYNUCLEAR AROMATIC HYDROCARBONS,	8310, 8270	610, 625	8oz CWM	1 L A.J.	(1) 4°C	S-14 Days, W-7 Days (4)
SEMI-VOLATILE ORGANICS	8270	625	8oz CWM	1 L.A.J	(1) 4°C	S-14 Days, W-7 Days (4)
EXPLOSIVES						
NITROAROMATICS & NITRAMINES BY HPLC	8330		8oz CWM	1 L.A.J	(1) 4°C	S-14 Days, W-7 Days (4)
VOLATILE & EXTRACTABLE HYDROCARBONS						
NONHALOGENATED VOLATILE ORGANICS	8015, 8260	8015, 624	4 oz CWM	40 ml Glass Vial	(1) pH<2 HCl,4°C	14 Days
TPH AS GASOLINE	Mod 8015	Mod 8015	4 oz CWM	40 ml Glass Vial	pH<2 HCL, 4°C,	14 Days
TPH AS DIESEL	Mod CA LUFT/8015	Mod CA LUFT/8015	Brass Tube	x2-1 L.A.J.	None Required	S, W-14 Days (4)
TEPH	Mod CA LUFT/8015	Mod CA LUFT/8015	Brass Tube	x2-1 L.A.J.	None Required	S, W-14 Days (4)
CHARACTERISTIC DETERMINATION						
TCLP EXTRACTION	1311	***	16 oz CWM	4 L.A.J.	None Required	
IGNITABILITY, FLASHPOINT	1010, CA Title 22	***	4 oz CWM	500 ml B.R.	None Required	

SEVERN TRENT SERVICES

STL San Francisco
Chain of Custody

1220 Quarry Lane ● Pleasanton CA 94566-4756
Phone: (925) 484-1919 ● Fax: (925) 484-1096

Figure 4-1

Reference #: ____________

Date ____________ Page _____ of _____

Report To	
Attn:	
Company:	
Address:	
Phone:	Email:
Bill To:	Sampled By:
Attn:	Phone:

Analysis Request

Sample ID	Date	Time	Matrix	Preserv.	TPH EPA - ☐ 8015/8021 ☐ 8260B ☐ Gas w/ ☐ BTEX ☐ MTBE	Purgeable Aromatics BTEX EPA - ☐ 8021 ☐ 8260B	TEPH EPA 8015M ☐ Silica Gel ☐ Diesel ☐ Motor Oil ☐ Other ___	Fuel Tests EPA 8260B: ☐ Gas ☐ BTEX ☐ Five Oxyenates ☐ DCA, EDB ☐ Ethanol	Purgeable Halocarbons (HVOCs) EPA 8021	Volatile Organics GC/MS (VOCs) ☐ EPA 8260B ☐ 624	Semivolatiles GC/MS ☐ EPA 8270 ☐ 625	Oil and Grease ☐ Petroleum (EPA 1664) ☐ Total	Pesticides ☐ EPA 8081 ☐ 608 PCBs ☐ EPA 8082 ☐ 608	PNAs by ☐ 8270 ☐ 8310	CAM17 Metals (EPA 6010/7470/7471)	Metals: ☐ Lead ☐ LUFT ☐ RCRA ☐ Other: ______	☐ W.E.T (STLC) ☐ TCLP	☐ Hexavalent Chromium ☐ pH (24h hold time for H_2O)	☐ Spec Cond. ☐ Alkalinity ☐ TSS ☐ TDS	Anions : ☐ Cl ☐ SO_4 ☐ NO_3 ☐ F ☐ Br ☐ NO_2 ☐ PO_4					Number of Containers

Project Info.	Sample Receipt
Project Name:	# of Containers:
Project#:	Head Space:
PO#:	Temp:
Credit Card#:	Conforms to record:

TAT	Std 5 Day	72h	48h	24h	Other:

Report: ☐ Routine ☐ Level 3 ☐ Level 4 ☐ EDD ☐ State Tank Fund EDF ☐ Global ID ________

Special Instructions / Comments:

1) Relinquished by:	2) Relinquished by:	3) Relinquished by:
Signature Time	Signature Time	Signature Time
Printed Name Date	Printed Name Date	Printed Name Date
Company	Company	Company

1) Received by:	2) Received by:	3) Received by:
Signature Time	Signature Time	Signature Time
Printed Name Date	Printed Name Date	Printed Name Date
Company	Company	Company

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Figure 4-2
Sample Receipt Checklist

Client Name: ___________________________ Date/Time Received: _________________________________
Date / Time

Reference/Subm #: _____________________ Received by:____

Checklist completed by: _______________________________________ Reviewed By:_______________
Signature / Date Initial/Date

Matrix: ☐ Soil ☐ Water ☐ Other ________________ Carrier name: Client – STL SF___________

Shipping container/cooler in good condition? Yes ____ No____ Not Present____

Custody seals intact on shipping container/cooler? Yes____ No____ Not Present____

Custody seals intact on sample bottles? Yes____ No____ Not Present____

Chain of custody present? Yes____ No_____

Chain of custody signed when relinquished and received? Yes____ No_____

Chain of custody agrees with sample labels? Yes____ No_____

Samples in proper container/bottle? Yes____ No_____

Sample containers intact? Yes_____No_____

Sufficient sample volume for indicated test? Yes_____No_____

All samples received within holding time? Yes_____No_____

Container/Temp Blank temperature in compliance? Temp:_____°C Yes_____No_____

Water - VOA vials have zero headspace?

No VOA vials submitted_____ Yes_____ No_____

Water - **pH acceptable upon receipt?** ☐ Yes ☐ No ☐ Checked by Voa chemist

☐ **pH adjusted**– Preservative used:
☐ HNO_3 ☐ HCl ☐ H_2SO_4 ☐ NaOH ☐ ZnOAc **Lot#**(s)____

Any No and/or NA (not applicable) response must be detailed in the comments section below.

===

Client contacted: __________________ Date contacted: ______________ Person contacted: ____________

Contacted by: __________________ Regarding: ____

Comments: ____

Corrective Action: ____

Table II

QA Objectives for Measurement Data

1. Liquid Matrices

METALS BY ICP (6010B)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/L)
Aluminum	<20	80-120	75-125	0.20
Antimony	<20	80-120	75-125	0.005
Arsenic	<20	80-120	75-125	0.005
Barium	<20	80-120	75-125	0.005
Beryllium	<20	80-120	75-125	0.005
Cadmium	<20	80-120	75-125	0.002
Calcium	<20	80-120	75-125	0.20
Chromium	<20	80-120	75-125	0.005
Cobalt	<20	80-120	75-125	0.005
Copper	<20	80-120	75-125	0.005
Iron	<20	80-120	75-125	0.20
Lead	<20	80-120	75-125	0.005
Magnesium	<20	80-120	75-125	0.20
Manganese	<20	80-120	75-125	0.005
Molybdenum	<20	80-120	75-125	0.005
Nickel	<20	80-120	75-125	0.005
Potassium	<20	80-120	75-125	1.0
Selenium	<20	80-120	75-125	0.005
Silver	<20	80-120	75-125	0.005
Sodium	<20	80-120	75-125	1.0
Thallium	<20	80-120	75-125	0.005
Vanadium	<20	80-120	75-125	0.005
Zinc	<20	80-120	75-125	0.01

MERCURY BY COLD VAPOR (7470A)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/L)
Mercury	<20	85-115	85-115	0.0002

METALS BY GFAA (7000 Series)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/L)
Arsenic	<20	85-115	85-115	0.002
Lead	<20	85-115	85-115	0.002
Selenium	<20	85-115	85-115	0.002
Thallium	<20	85-115	85-115	0.002

QA Objectives for Measurement Data

HALOGENATED VOLATILE ORGANIC COMPOUNDS BY GC (8021B)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
Bromodichloromethane				0.5
Bromoform				2
Bromomethane				1
Carbon tetrachloride				0.5
Chlorobenzene	<20	70-130	70-130	0.5
Chloroethane				0.5
2-Chloroethylvinylether				0.5
Chloroform				0.5
Chloromethane				1
Dibromochloromethane				0.5
1,2-Dichlorobenzene				0.5
1,3-Dichlorobenzene				0.5
1,4-Dichlorobenzene				0.5
Dichlorodifluoromethane				1
1,1-Dichloroethane				0.5
1,2-Dichloroethane				0.5
1,1-Dichloroethene	<20	70-130	70-130	0.5
cis-1,2-Dichloroethene				0.5
trans-1,2-Dichloroethene				0.5
1,2-Dichloropropane				0.5
cis-1,3-Dichloropropene				0.5
trans-1,3-Dichloropropene				0.5
Methylene chloride				5
1,1,2,2-Tetrachloroethane				0.5
Tetrachloroethene				0.5
1,1,1-Trichloroethane				0.5
1,1,2-Trichloroethane				0.5
Trichloroethene	<20	70-130	70-130	0.5
Trichlorofluoromethane				0.5
Trichlorotrifluroethane				2
Vinyl chloride				0.5
1-Chloro-2-fluorobenzene (surr.)		70-130	70-130	

QA Objectives for Measurement Data

VOLATILE AROMATIC COMPOUNDS BY GC (8021B)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
MTBE				5
Benzene	<20	77-123	65-135	0.5
Chlorobenzene				0.5
1,2-Dichlorobenzene				0.5
1,3-Dichlorobenzene				0.5
1,4-Dichlorobenzene				0.5
Ethylbenzene	<20	70-130	65-135	0.5
Toluene	<20	78-122	65-135	0.5
Xylenes, total	<20	75-125	65-135	0.5
4-Bromofluorobenzene (surr)		50-150	50-150	
Trifluorotoluene (surr)		58-124	58-124	

PETROLEUM HYDROCARBONS (8015 Modified)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
Diesel	<25	60-130	60-130	50
o-Terphenyl (surr)		60-130	60-130	
Motor Oil				500
Kerosene				50
Gasoline	<20	75-125	65-135	50

GLYCOLS (8015 Modified)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/L)
Diethylene Glycol	<35	60-130	60-130	10
Ethylene Glycol	<35	60-130	60-130	10
Tetraethylene Glycol	<35	60-130	60-130	10
Triethylene Glycol	<35	60-130	60-130	10
2-(2-Butoxyethoxy) Ethanol (surr)		60-130	60-130	

QA Objectives for Measurement Data

VOLATILE ORGANIC COMPOUNDS BY GC/MS (624)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
Benzene	<20	69-129	69-129	0.5
Bromodichloromethane				0.5
Bromoform				0.5
Bromomethane				1
Carbon tetrachloride				0.5
Chlorobenzene	<20	61-121	61-121	0.5
Chloroethane				0.5
2-Chloroethylvinyl ether				1
Chloroform				0.5
Chloromethane				0.5
Dibromochloromethane				0.5
1,2-Dichlorobenzene				0.5
1,3-Dichlorobenzene				0.5
1,4-Dichlorobenzene				0.5
1,1-Dichloroethane				0.5
1,2-Dichloroethane				0.5
1,1-Dichloroethene	<20	65-125	65-125	0.5
cis-1,2-Dichloroethene				1
trans-1,2-Dichloroethene				0.5
1,2-Dichloropropane				0.5
cis-1,3-Dichloropropene				0.5
trans-1,3-Dichloropropene				0.5
Ethylbenzene				0.5
Methylene chloride				0.5
MTBE				0.5
1,1,2,2-Tetrachloroethane				0.5
Tetrachloroethene				0.5
Toluene	<20	70-130	70-130	0.5
1,1,1-Trichloroethane				0.5
1,1,2-Trichloroethane				0.5
Trichloroethene	<20	74-134	74-134	0.5
Trichlorofluoromethane				1
Vinyl chloride				0.5
Total Xylenes				0.5
4-Bromofluorobenzene (surr)		86-115	86-115	
1,2-Dichloroethane-d4 (surr)		76-114	76-114	
Toluene-d8 (surr)		88-110	88-110	

QA Objectives for Measurement Data

VOLATILE ORGANIC COMPOUNDS BY GC/MS (8260B)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
Acetone				50
Benzene	<20	69-129	69-129	1
Bromobenzene				1
Bromochloromethane				1
Bromodichloromethane				1
Bromoform				1
Bromomethane				5
2 Butanone (MEK)				50
n-Butylbenzene				1
sec-Butylbenzene				1
tert-Butylbenzene				1
Carbon disulfide				5
Carbon tetrachloride				1
Chlorobenzene	<20	61-121	61-121	1
Chloroethane				1
2-Chloroethylvinyl ether				5 (1)
Chloroform				1
Chloromethane				1
2-Chlorotoluene				1
4-Chlorotoluene				1
Dibromochloromethane				1
1,2-Dibromo-3-chloropropane				1
1,2-Dibromoethane				1
Dibromomethane				1
1,2-Dichlorobenzene				1
1,3-Dichlorobenzene				1
1,4-Dichlorobenzene				1
Dichlorodifluormethane				1
1,1-Dichloroethane				1
1,2-Dichloroethane				1
1,1-Dichloroethene	<20	65-125	65-125	1
cis-1,2-Dichloroethene				1
trans-1,2-Dichloroethene				1
1,2-Dichloropropane				1
1,3-Dichloropropane				1
2,2-Dichloropropane				1
1,1-Dichloropropene				1
cis-1,3-Dichloropropene				1
trans-1,3-Dichloropropene				1

QA Objectives for Measurement Data

VOLATILE ORGANIC COMPOUNDS BY GC/MS (8260B) – Continued

Ethylbenzene				1
Hexachlorobutadiene				1
2-Hexanone				50
Isopropylbenzene				1
p-Isopropyltoluene				1
Methylene chloride				5
4-Methyl-2-pentanone (MIBK)				50
MTBE				5
Naphthalene				1
n-Propylbenzene				1
Styrene				1
1,1,1,2-Tetrachloroethane				1
1,1,2,2-Tetrachloroethane				1
Tetrachloroethene				1
Toluene	<20	70-130	70-130	1
1,2,3-Trichlorobenzene				1
1,2,4-Trichlorobenzene				1
1,1,1-Trichloroethane				1
1,1,2-Trichloroethane				1
Trichloroethene	<20	74-134	74-134	1
Trichlorofluoromethane				1
1,2,3-Trichloropropane				1
Trichlorotriflouroethane				5
1,2,4-Trimethylbenzene				1
1,3,5-Trimethylbenzene				1
Vinyl acetate				25
Vinyl chloride				1
Xylenes, total				1
4-Bromofluorobenzene (surr)		86-115	86-115	
1,2-Dichloroethane-d4 (surr)		76-114	76-114	
Toluene-d8 (surr)		88-110	88-110	

QA Objectives for Measurement Data

ORGANOCHLORINE PESTICIDES & PCBs BY GC (608)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
Aldrin	<25	65-135	65-135	0.005
A-BHC				0.01
B-BHC				0.005
Γ-BHC	<20	65-135	65-135	0.02
Δ-BHC				0.005
Technical Chlordane				0.1
P,p'-DDD				0.05
P,p'-DDE				0.05
p.p'-DDT	<20	65-135	65-135	0.01
Dieldrin	<20	65-135	65-135	0.01
Endosulfan I				0.02
Endosulfan II				0.01
Endosulfan Sulfate				0.05
Endrin	<20	65-135	65-135	0.01
Endrin aldehyde				0.01
Heptachlor	<20	65-135	65-135	0.01
Heptachlor epoxide				0.01
Toxaphene				0.5
PCB-1016	<30	65-135	65-135	0.5
PCB-1221				0.5
PCB-1232				0.5
PCB-1242				0.5
PCB-1248				0.5
PCB-1254				0.5
PCB-1260	<30	65-135	65-135	0.5
2,4,5,6-Tetrachloroxylene (surr)		62-123	62-123	
Decachlorobiphenyl (surr)		56-136	56-136	

QA Objectives for Measurement Data

ORGANOCHLORINE PESTICIDES BY GC (8081A)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
Aldrin	<25	65-135	65-135	0.06
α-BHC				0.06
β-BHC				0.06
γ-BHC	<20	65-135	65-135	0.06
δ-BHC				0.06
Alpha-Chlordane				0.06
Gamma-Chlordane				0.06
Technical Chlordane				1
p,p'-DDD				0.06
p,p'-DDE				0.08
p.p'-DDT	<20	65-135	65-135	0.06
Dieldrin	<20	65-135	65-135	0.06
Endosulfan I				0.06
Endosulfan II				0.06
Endosulfan Sulfate				0.06
Endrin	<20	65-135	65-135	0.06
Endrin aldehyde				0.06
Endrin Ketone				0.06
Heptachlor	<20	65-135	65-135	0.06
Heptachlor epoxide				0.06
p,p'-Methoxychlor				0.06
Toxaphene				1
2,4,5,6-Tetrachloro-m-xylene (surr)		62-123	62-123	
Decachlorobiphenyl (surr)		56-136	56-136	

PCBs BY GC (8082)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
PCB-1016	<30	65-135	65-135	0.5
PCB-1221				0.5
PCB-1232				0.5
PCB-1242				0.5
PCB-1248				0.5
PCB-1254				0.5
PCB-1260	<30	65-135	65-135	0.5
2,4,5,6-Tetrachloroxylene (surr)		62-123	62-123	
Decachlorobiphenyl (surr)		56-136	56-136	

QA Objectives for Measurement Data

SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS (625)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
Acenaphthene	<30	56-118	56-118	1
Acenaphthylene				2
Azobenzene				1
Benzo(a)anthracene				2
Benzo(b)fluoranthene				2
Benzo(k)fluoranthene				2
Benzo(g,h,i)perylene				2
Benzo(a)pyrene				2
Bis(2-chloroethyl)ether				1
Bis(2-chloroethoxy)methane				5
Bis(2-chloroisopropyl)ether				2
Bis(2-ethylhexyl)phthalate				5
4-Bromophenyl phenyl ether				5
Butyl benzyl phthalate				5
4-Chloro-3-methylphenol	<31	22-147	22-147	5
2-Chloronaphthalene				2
2-Chlorophenol	<25	23-134	23-134	2
4-Chlorophenyl phenyl ether				2
Chrysene				2
Dibenzo(a,h)anthracene				2
1,2-Dichlorobenzene				2
1,3-Dichlorobenzene				2
1,4-Dichlorobenzene	<30	36-97	36-97	2
3,3-Dichlorobenzidine				5
2,4-Dichlorophenol				1
Diethyl phthalate				5
2,4-Dimethylphenol				1
Dimethyl phthalate				5
Di-n-butyl phthalate				5
4,6-Dinitro-2-methylphenol				10
2,4-Dinitrophenol				5
2,4-Dinitrotoluene	<35	39-139	39-139	2
2,6-Dinitrotoluene				5
Di-n-octyl phthalate				5
Fluoranthene				2
Fluorene				5
Hexachlorobenzene				2
Hexachlorobutadiene				2
Hexachlorocyclopentadiene				5

QA Objectives for Measurement Data

SEMIVOLATILES BY GC/MS (625) – Continued

Hexachloroethane				2
Indeno(1,2,3-cd)pyrene				2
Isophorone				2
Naphthalene				2
Nitrobenzene				2
2-Nitrophenol				10
4-Nitrophenol	<35	1-51	1-51	10
N-Nitroso-di-n-propylamine	<34	10-130	10-130	2
N-Nitrosodiphenylamine				1
Pentachlorophenol	<35	45-125	45-125	5
Phenanthrene				2
Phenol	<35	12-89	12-89	1
Pyrene	<35	52-115	52-115	2
1,2,4-Trichlorobenzene	<35	44-142	44-142	1
2,4,6-Trichlorophenol				2
Nitrobenzene - d5 (surr)		35-114	35-114	
2-Fluorobiphenyl (surr)		43-116	43-116	
p-Terphenyl-dl4 (surr)		33-141	33-141	
Phenol-d6 (surr)		10-110	10-110	
2-Fluorophenol (surr)		25-100	25-100	
2,4,6-Tribromophenol (surr)		10-123	10-123	

QA Objectives for Measurement Data

SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS (8270C)	Precision (% RPD)	Accuracy (%) LSC/LCSD	and MS/MSD	Rep.Limit (ug/L)
Acenaphthene	<30	56-118	56-118	2
Acenaphthylene				2
Anthracene				2
Benzoic acid				10
Benzo(a)anthracene				2
Benzo(b)fluoranthene				2
Benzo(k)fluoranthene				2
Benzo(g,h,i)perylene				2
Benzo(a)pyrene				2
Benzyl alcohol				5
Bis(2-chloroethoxy)methane				5
Bis(2-chloroethyl)ether				2
Bis(2-chloroisopropyl)ether				2
Bis(2-ethylhexyl)phthalate				10
4-Bromophenyl phenyl ether				5
Butyl benzyl phthalate				5
4-Chloroaniline				2
4-Chloro-3-methylphenol	<31	22-147	22-147	5
2-Chloronaphthalene				2
2-Chlorophenol	<25	23-134	23-134	2
4-Chlorophenyl phenyl ether				5
Chrysene				2
Dibenzo(a,h)anthracene				2
Dibenzofuran				2
Di-n-butyl phthalate				5
1,2-Dichlorobenzene				2
1,3-Dichlorobenzene				2
1,4-Dichlorobenzene	<30	36-97	36-97	2
3,3'-Dichlorobenzidine				5
2,4-Dichlorophenol				2
Diethyl phthalate				5
2,4-Dimethylphenol				2
Dimethyl phthalate				5
4,6-Dinitro-2-methylphenol				10
2,4-Dinitrophenol				10
2,4-Dinitrotoluene	<35	39-139	39-139	2
2,6-Dinitrotoluene				5
Di-n-octyl phthalate				5
Fluoranthene				2

QA Objectives for Measurement Data

SEMIVOLATILES BY GC/MS (8270C) – Continued

Fluorene				2
Hexachlorobenzene				2
Hexachlorobutadiene				2
Hexachlorocyclopentadiene				5
Hexachloroethane				2
Indeno(1,2,3-cd)pyrene				2
Isophorone				2
2-Methylnaphthalene				2
2-Methylphenol				2
4-Methylphenol				2
Naphthalene				2
2-Nitroaniline				10
3-Nitroaniline				2
4-Nitroaniline				10
Nitrobenzene				2
2-Nitrophenol				2
4-Nitrophenol	<35	1-51	1-51	10
N-Nitroso-di-n-phenylamine				2
N-Nitroso-di-n-propylamine	<34	10-130	10-130	2
Pentachlorophenol	<35	45-125	45-125	10
Phenanthrene				2
Phenol	<35	12-89	12-89	2
Pyrene	<35	52-115	52-115	2
1,2,4-Trichlorobenzene	<35	44-142	44-142	2
2,4,5-Trichlorophenol				2
2,4,6-Trichlorophenol				2
Nitrobenzene - d5 (surr)		35-114	35-114	
2-Fluorobiphenyl (surr)		43-116	43-116	
p-Terphenyl-dl4 (surr)		33-141	33-141	
Phenol-d6 (surr)		10-110	10-110	
2-Fluorophenol (surr)		25-100	25-100	
2,4,6-Tribromophenol (surr)		10-123	10-123	

QA Objectives for Measurement Data

POLYNUCLEAR AROMATIC HYDROCARBONS BY GC/MS (8270C-SIM)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
Acenaphthene	<30	50-150	50-150	0.1
Acenaphthylene				0.1
Anthracene				0.1
Benzo(a)anthracene				0.1
Benzo(b)fluoranthene				0.1
Benzo(k)fluoranthene				0.1
Benzo(a)pyrene	<30	50-150	50-150	0.1
Benzo(g,h,i)perylene				0.1
Chrysene	<30	50-150	50-150	0.1
Dibenzo(a,h)anthracene				0.1
Fluoranthene				0.1
Fluorene				0.1
Indeno(1,2,3-cd)pyrene				0.1
Naphthalene				0.1
Phenanthrene	<30	50-150	50-150	0.1
Pyrene	<30	50-150	50-150	0.1
2-Fluorobiphenyl (surr)		43-116	43-116	
p-Terphenyl-d14 (surr)		33-141	33-141	

QA Objectives for Measurement Data

POLYNUCLEAR AROMATIC HYDROCARBONS BY HPLC (8310)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
Acenaphthene				0.1
Acenaphthylene				0.1
Anthracene				0.05
Benzo(a)anthracene				0.1
Benzo(b)fluoranthene				0.1
Benzo(k)fluoranthene				0.05
Benzo(a)pyrene	<35	50-150	50-150	0.1
Benzo(g,h,i)perylene				0.1
Chrysene	<35	50-150	50-150	0.1
Dibenzo(a,h)anthracene				0.1
Fluoranthene				0.15
Fluorene				0.1
Indeno(1,2,3-cd)pyrene				0.1
Naphthalene	<35	50-150	50-150	0.15
Phenanthrene	<35	50-150	50-150	0.1
Pyrene	<35	50-150	50-150	0.15
1-Methylnaphthalene (surr)		50-150	50-150	

NITROAROMATICS and NITRAMINES BY HPLC (8330)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/L)
1,3,5-TNB	<25	70-130	70-130	0.25
1,3-DNB	<25	70-130	70-130	0.1
2,4,6-TNT	<25	70-130	70-130	0.17
2,4-DNT	<25	70-130	70-130	0.1
2,6-DNT	<25	70-130	70-130	0.3
2-Am-DNT	<25	70-130	70-130	1
2-NT	<25	70-130	70-130	1
3-NT	<25	70-130	70-130	1
4-Am-DNT	<25	70-130	70-130	1
4-NT	<25	70-130	70-130	1
HMX	<25	70-130	70-130	1
NB	<25	70-130	70-130	0.5
RDX	<25	70-130	70-130	0.5
TETRYL	<25	70-130	70-130	1
3,4-DNT (surr)		70-130	70-130	

QA Objectives for Measurement Data

GENERAL CHEMISTRY	Precision (% RPD)	Accuracy (%) LCS/LCSD and MS/MSD		Rep.Limit (mg/L)
Alkalinity, Total (310.1)	<20	80-120		5.0
Bromide (300.0)	<20	80-120	80-120	1.0
Chloride (300.0)	<20	80-120	80-120	1.0
Conductivity (9050A)				
Flash Point (1010)				
Fluoride (300.0)	<20	80-120	80-120	1.0
Hexavalent Chromium (7196A)	<20	80-120	80-120	0.01
Nitrate (300.0)	<20	80-120	80-120	1.0
Nitrite (300.0)	<20	80-120	80-120	1.0
Oil & Grease, gravimetric (SM 5520B/1664)	<18	79-114	79-114	1.0
Orthophosphate (300.0)	<20	80-120	80-120	1.0
pH (9040B)				
RCI (CA Title 22)				
Residue, Total (160.3)	<20	80-120		10
Settleable Solids (160.5)	<20	80-120		0.1 (ml/L)
Sulfate (300.0)	<20	80-120	80-120	1.0
Total Dissolved Solids (160.1)	<20	80-120		10
Total Suspended Solids (160.2)	<20	80-120		10
Total Suspended Solids, low level (160.2)	<20	80-120		1.0

QA Objectives for Measurement Data **2. Solid Matrices**

METALS BY ICP (6010B)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/Kg)
Aluminum	<20	80-120	75-125	5
Antimony	<20	80-120	75-125	2
Arsenic	<20	80-120	75-125	1
Barium	<20	80-120	75-125	1
Beryllium	<20	80-120	75-125	0.5
Cadmium	<20	80-120	75-125	0.5
Calcium	<20	80-120	75-125	5
Chromium	<20	80-120	75-125	1
Cobalt	<20	80-120	75-125	1
Copper	<20	80-120	75-125	1
Iron	<20	80-120	75-125	1
Lead	<20	80-120	75-125	1
Magnesium	<20	80-120	75-125	5
Manganese	<20	80-120	75-125	1
Molybdenum	<20	80-120	75-125	1
Nickel	<20	80-120	75-125	1
Potassium	<20	80-120	75-125	25
Selenium	<20	80-120	75-125	2
Silver	<20	80-120	75-125	1
Sodium	<20	80-120	75-125	25
Thallium	<20	80-120	75-125	1
Vanadium	<20	80-120	75-125	1
Zinc	<20	80-120	75-125	1

MERCURY BY COLD VAPOR (7471)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/Kg)
Mercury	<20	85-115	85-115	0.05

METALS BY GFAA (7000 Series)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/Kg)
Arsenic	<20	85-115	85-115	0.2
Lead	<20	85-115	85-115	0.2
Selenium	<20	85-115	85-115	0.2
Thallium	<20	85-115	85-115	0.2

METALS BY FLAME AA (7000 Series)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/Kg)
Lead	<20	85-115	85-115	5

QA Objectives for Measurement Data

HALOGENATED VOLATILE ORGANIC COMPOUNDS BY GC/MS (8260B)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/Kg)
Bromodichloromethane				5
Bromoform				5
Bromomethane				10
Carbon tetrachloride				5
Chlorobenzene	<20	61-121	61-121	5
Chloroethane				10
2-Chloroethylvinylether				50
Chloroform				5
Chloromethane				10
Dibromochloromethane				5
1,2-Dichlorobenzene				5
1,3-Dichlorobenzene				5
1,4-Dichlorobenzene				5
Dichlorodifluoromethane				10
1,1-Dichloroethane				5
1,2-Dichloroethane				5
1,1-Dichloroethene	<20	65-125	65-125	5
cis-1,2-Dichloroethene				5
trans-1,2-Dichloroethene				5
1,2-Dichloropropane				5
cis-1,3-Dichloropropene				5
trans-1,3-Dichloropropene				5
Methylene chloride				5
1,1,2,2-Tetrachloroethane				5
Tetrachloroethene				5
1,1,1-Trichloroethane				5
1,1,2-Trichloroethane				5
Trichloroethene	<20	74-134	74-134	5
Trichlorofluoromethane				5
Trichlorotrifluroethane				5
Vinyl chloride				5
4-Bromofluorobenzene (surr)		74-121	74-121	
1,2-Dichloroethane-d4 (surr)		70-121	70-121	
Toluene-d8 (surr)		81-117	81-117	

QA Objectives for Measurement Data

VOLATILE AROMATIC COMPOUNDS BY GC (8021B)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/Kg)
MTBE				5
Benzene	<35	77-123	65-135	5
Chlorobenzene				5
1,2-Dichlorobenzene				5
1,3-Dichlorobenzene				5
1,4-Dichlorobenzene				5
Ethylbenzene	<35	70-130	65-135	5
Toluene	<35	78-122	65-135	5
Xylenes, total	<35	75-125	65-135	5
4-Bromofluorobenzene (surr)		58-124	58-124	
Trifluorotoluene (surr)		53-125	53-125	

PETROLEUM HYDROCARBONS (8015 Modified)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/Kg)
Diesel	<25	60-130	60-130	1
o-Terphenyl (surr)		60-130	60-130	
Motor Oil				50
Kerosene				1
Gasoline	<35	75-125	65-135	1

GLYCOLS (8015 Modified)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/Kg)
Diethylene Glycol	<35	60-130	60-130	25
Ethylene Glycol	<35	60-130	60-130	25
Tetraethylene Glycol	<35	60-130	60-130	25
Triethylene Glycol	<35	60-130	60-130	25
2-(2-Butoxyethoxy) Ethanol (surr)		60-130	60-130	

QA Objectives for Measurement Data

VOLATILE ORGANIC COMPOUNDS BY GC/MS (8260B)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/Kg)
Acetone				50
Benzene	<20	69-129	69-129	5
Bromobenzene				5
Bromochloromethane				20
Bromodichloromethane				5
Bromoform				5
Bromomethane				10
2 Butanone (MEK)				50
n-Butylbenzene				5
sec-Butylbenzene				5
tert-Butylbenzene				5
Carbon disulfide				5
Carbon tetrachloride				5
Chlorobenzene	<20	61-121	61-121	5
Chloroethane				10
2-Chloroethylvinyl ether				50
Chloroform				5
Chloromethane				10
2-Chlorotoluene				5
4-Chlorotoluene				5
Dibromochloromethane				5
1,2-Dibromo-3-chloropropane				50
1,2-Dibromoethane				10
Dibromomethane				10
1,2-Dichlorobenzene				5
1,3-Dichlorobenzene				5
1,4-Dichlorobenzene				5
Dichlorodifluormethane				10
1,1-Dichloroethane				5
1,2-Dichloroethane				5
1,1-Dichloroethene	<20	65-125	65-125	5
cis-1,2-Dichloroethene				5
trans-1,2-Dichloroethene				5
1,2-Dichloropropane				5
1,3-Dichloropropane				5
2,2-Dichloropropane				5
1,1-Dichloropropene				5
cis-1,3-Dichloropropene				5
trans-1,3-Dichloropropene				5

QA Objectives for Measurement Data

VOLATILE ORGANICS BY GC/MS (8260B) – Continued

Ethylbenzene				5
Hexachlorobutadiene				5
2-Hexanone				50
Isopropylbenzene				5
p-Isopropyltoluene				5
Methylene chloride				5
4-Methyl-2-pentanone (MIBK)				50
MTBE				5
Naphthalene				10
n-Propylbenzene				5
Styrene				5
1,1,1,2-Tetrachloroethane				5
1,1,2,2-Tetrachloroethane				5
Tetrachloroethene				5
Toluene	<20	70-130	70-130	5
1,2,3-Trichlorobenzene				5
1,2,4- Trichlorobenzene				5
1,1,1-Trichloroethane				5
1,1,2-Trichloroethane				5
Trichloroethene	<20	74-134	74-134	5
Trichlorofluoromethane				5
1,2,3-Trichloropropane				5
Trichlorotriflouroethane				5
1,2,4-Trimethylbenzene				5
1,3,5-Trimethylbenzene				5
Vinyl acetate				50
Vinyl chloride				5
Xylenes, total				5
4-Bromofluorobenzene (surr)		74-121	74-121	
1,2-Dichloroethane-d4 (surr)		70-121	70-121	
Toluene-d8 (surr)		81-117	81-117	

QA Objectives for Measurement Data

ORGANOCHLORINE PESTICIDES BY GC (8081A)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/Kg)
Aldrin	<25	37-136	37-136	2
α-BHC				2
β-BHC				2
γ-BHC	<35	37-137	37-137	2
δ-BHC				2
alpha-Chlordane				2
gamma-Chlordane				2
Technical Chlordane				50
p,p'-DDD				2
p,p'-DDE				2
p,p'-DDT	<35	55-132	55-132	2
Dieldrin	<35	58-135	58-135	2
Endosulfan I				2
Endosulfan II				2
Endosulfan sulfate				2
Endrin	<35	58-134	58-134	2
Endrin aldehyde				2
Endrin ketone				2
Heptachlor	<20	40-136	40-136	2
Heptachlor epoxide				2
p,p'-Methoxychlor				2
Toxaphene				100
2,4,5,6-Tetrachloro-m-xylene (surr)		50-125	50-125	
Decachlorobiphenyl (surr)		46-142	46-142	

PCBs BY GC (8082)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/Kg)
PCB-1016	<30	65-135	65-135	50
PCB-1221				50
PCB-1232				50
PCB-1242				50
PCB-1248				50
PCB-1254				50
PCB-1260	<30	65-135	65-135	50
2,4,5,6-Tetrachloroxylene (surr)		50-125	50-125	
Decachlorobiphenyl		46-142	46-142	

QA Objectives for Measurement Data

SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS (8270C)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/Kg)
Acenaphthene	<30	49-102	49-102	0.067
Acenaphthylene				0.067
Anthracene				0.067
Benzoic acid				0.33
Benzo(a)anthracene				0.067
Benzo(b)fluoranthene				0.067
Benzo(k)fluoranthene				0.067
Benzo(g,h,i)perylene				0.067
Benzo(a)pyrene				0.067
Benzyl alcohol				0.17
Bis(2-chloroethoxy)methane				0.17
Bis(2-chloroethyl)ether				0.067
Bis(2-chloroisopropyl)ether				0.067
Bis(2-ethylhexyl)phthalate				0.33
4-Bromophenyl phenyl ether				0.17
Butyl benzyl phthalate				0.17
4-Chloroaniline				0.067
4-Chloro-3-methylphenol	<33	26-103	26-103	0.17
2-Chloronaphthalene				0.067
2-Chlorophenol	<35	27-123	27-123	0.067
4-Chlorophenyl phenyl ether				0.17
Chrysene				0.067
Dibenzo(a,h)anthracene				0.067
Dibenzofuran				0.067
Di-n-butyl phthalate				0.17
1,2-Dichlorobenzene				0.067
1,3-Dichlorobenzene				0.067
1,4-Dichlorobenzene	<30	28-104	28-104	0.067
3,3'-Dichlorobenzidine				0.17
2,4-Dichlorophenol				0.067
Diethyl phthalate				0.17
2,4-Dimethylphenol				0.067
Dimethyl phthalate				0.17
4,6-Dinitro-2-methylphenol				0.33
2,4-Dinitrophenol				0.33
2,4-Dinitrotoluene	<38	39-139	39-139	0.067
2,6-Dinitrotoluene				0.067
Di-n-octyl phthalate				0.17
Fluoranthene				0.067

QA Objectives for Measurement Data

SEMIVOLATILE ORGANICS BY GC/MS (8270C) – Continued

Fluorene				0.067
Hexachlorobenzene				0.067
Hexachlorobutadiene				0.067
Hexachlorocyclopentadiene				0.17
Hexachloroethane				0.067
Indeno(1,2,3-cd)pyrene				0.067
Isophorone				0.067
2-Methylnaphthalene				0.067
2-Methylphenol				0.067
4-Methylphenol				0.067
Naphthalene				0.067
2-Nitroaniline				0.33
3-Nitroaniline				0.067
4-Nitroaniline				0.33
Nitrobenzene				0.067
2-Nitrophenol				0.067
4-Nitrophenol	<35	17-109	17-109	0.33
N-Nitroso-di-n-phenylamine				0.067
N-Nitroso-di-n-propylamine	<39	25-114	25-114	0.067
Pentachlorophenol	<35	11-114	11-114	0.33
Phenanthrene				0.067
Phenol	<35	26-90	26-90	0.067
Pyrene	<35	25-117	25-117	0.067
1,2,4-Trichlorobenzene	<35	38-107	38-107	0.067
2,4,5-Trichlorophenol				0.067
2,4,6-Trichlorophenol				0.067
Nitrobenzene - d5 (surr)		23-120	23-120	
2-Fluorobiphenyl (surr)		30-115	30-115	
p-Terphenyl-dl4 (surr)		18-137	18-137	
Phenol-d6 (surr)		24-113	24-113	
2-Fluorophenol (surr)		25-121	25-121	
2,4,6-Tribromophenol (surr)		19-122	19-122	

QA Objectives for Measurement Data

POLYNULCLEAR AROMATIC HYDROCARBONS BY 8270C-SIM	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/Kg)
Acenaphthene	<30	50-150	50-150	5
Acenaphthylene				5
Anthracene				5
Benzo(a)anthracene				5
Benzo(b)fluoranthene				5
Benzo(k)fluoranthene				5
Benzo(a)pyrene	<30	50-150	50-150	5
Benzo(g,h,i)perylene				5
Chrysene	<30	50-150	50-150	5
Dibenzo(a,h)anthracene				5
Fluoranthene				5
Fluorene				5
Lndeno(1,2,3 cd)pyrene				5
Napthalene				5
Phenanthrene	<30	50-150	50-150	5
Pyrene	<30	50-150	50-150	5
2-Fluorobiphenyl (surr)		30-115	30-115	
p-Terphenyl-d14 (surr)		18-137	18-137	

POLYNULCLEAR AROMATIC HYDROCARBONS BY HPLC 8310	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (ug/Kg)
Acenaphthene				10
Acenaphthylene				10
Anthracene				5
Benzo(a)anthracene				5
Benzo(b)fluoranthene				5
Benzo(k)fluoranthene				5
Benzo(a)pyrene	<35	50-150	50-150	5
Benzo(g,h,i)perylene				10
Chrysene	<35	50-150	50-150	5
Dibenzo(a,h)anthracene				10
Fluoranthene				5
Fluorene				5
Lndeno(1,2,3 cd)pyrene				10
Napthalene	<35	50-150	50-150	15
Phenanthrene	<35	50-150	50-150	5
Pyrene	<35	50-150	50-150	5
1-Methylnaphthalene (surr)		50-150	50-150	

QA Objectives for Measurement Data

NITROAROMATICS and NITRAMINES BY HPLC (8330)	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/Kg)
1,3,5-TNB	<35	65-135	65-135	0.25
1,3-DNB	<35	65-135	65-135	0.25
2,4,6-TNT	<35	65-135	65-135	0.25
2,4-DNT	<35	65-135	65-135	0.25
2,6-DNT	<35	65-135	65-135	0.25
2-Am-DNT	<35	65-135	65-135	0.25
2-NT	<35	65-135	65-135	0.25
3-NT	<35	65-135	65-135	0.25
4-Am-DNT	<35	65-135	65-135	0.25
4-NT	<35	65-135	65-135	0.25
HMX	<35	65-135	65-135	1
NB	<35	65-135	65-135	0.25
RDX	<35	65-135	65-135	1
TETRYL	<35	65-135	65-135	1
3,4-DNT (surr)		65-135	65-135	

GENERAL CHEMISTRY	Precision (% RPD)	Accuracy (%) LSC/LCSD and	MS/MSD	Rep.Limit (mg/Kg)
Alkalinity, Total (310.1)	<20	80-120		20
Bromide (300.0)	<20	80-120	80-120	10
Chloride (300.0)	<20	80-120	80-120	10
Conductivity (9050)				
Fluoride (300.0)	<20	80-120	80-120	10
Hexavalent Chromium (7196)	<20	80-120	80-120	0.2
Nitrate (300.0)	<20	80-120	80-120	10
Nitrite (300.0)	<20	80-120	80-120	10
Oil & Grease, gravimetric (SM 5520E/1664)	<20	80-120	80-120	50
Orthophosphate (300.0)	<20	80-120	80-120	10
pH (9045)				
Residue, Total	<20	80-120		10 (mg)
Sulfate (300.0)	<20	80-120	80-120	10

5.0 Calibration and Standardization Procedures and Equipment Maintenance

5.1 Standards Preparation -

STL San Francisco will prepare its analytical calibration standards using only chemicals that are ACS reagent grade or better or purchase commercially prepared standards from reputable sources, which furnish certificates of analyses with each standard. Whenever possible, only standards or reagents that are traceable to EPA, NIST or other federal standards will be used. If traceable standards are not available, the basis for calibration will be fully documented and approved by the Team Leader and the QA Department.

In each analytical run, all calibration standards will be verified against second-source control standards. A standards logbook will be maintained for all standards purchased or prepared by STL San Francisco. For purchased standards, date received, source, manufacturer's specifications, and date opened will be logged into the standards logbook. Dates received and opened will also be written on the standard container.

As in-house and/or working standards are prepared, preparation work sheets will be completed which contain the following information: analyst's name, date prepared, manufacturer and lot number, concentrations and dilutions, weights and volumes used, solvents used, storage instructions, expiration date and safety precautions.

Information sheets on new standards will be distributed with the standards. Expired standards will be immediately disposed.

5.1.1 Expiration Criteria of Standard Quality Control Materials and Reagents -

For standards, quality control materials, and reagents, all expiration dates as suggested by various manufacturers are honored by STL San Francisco’s personnel. No expiration date for subsequent standards or reagents generated from these sources will extend beyond the original expiration date. Furthermore, organic and inorganic sections each have its expanded rules for these materials (Refer to SOPs 3.03.01 & 3.03.02).

1) For organic analysis

a) Neat material that does not have a recommended expiration date (e.g. diesel fuel, motor oil, other fuel hydrocarbons) will be assigned an expiration date of five years from the date it was acquired.

b) Intermediate stock solutions will be assigned an expiration date of one year or the actual expiration date stated by the manufacturer, if it is less than one year.

c) Laboratory prepared standards will be assigned an expiration date of six months from the date prepared. However, if the parent solution has a shorter expiration date, the shorter period must be honored.
2) For inorganic analysis

a) For standards that have concentration levels less than 0.1 mg/L, the expiration period is 24 hours.

b) For standards that have concentration levels higher than 0.1 mg/L, the expiration date is six months from the date it is prepared unless the parent solution has a shorter expiration date. In that case, the shorter period will be honored.

3) For volatile and /or unstable compounds, refer to specific SOPs for information on shelf-life (e.g. gaseous compounds in standard mixture).

5.2 Calibration -

Calibration procedures are method dependent. Each method SOP specifically describes calibration procedures that will be followed. The general procedures summarized below are guidelines only. The detailed procedures contained in the method-specific SOPs will take precedence. Project-specific quality requirements may necessitate greater or lesser rigor in calibration requirements.

5.2.1 Calibration Criteria for GC/MS:

- **Tuning.** Every 12 hours, before calibration and analyses, the GC/MS will meet the standard mass spectral abundance criteria with a 50 ng injection of a system performance check compound, DFTPP for acid/base/neutrals and BFB for volatiles.
- **Initial Calibration via Internal Standard.** A blank and a minimum of five levels of standards will be required. The RSD requirement of less than 15% for each target analyte and less than 30% for each individual CCC is required as evidence of sufficient linearity to employ an average response factor.
- **System Performance Check Compound (SPCC) Response.** SPCCs will be monitored run with the initial calibration and continuing calibration.
- **Calibration Check Compounds (CCC) Response Factor Variation with Concentration.** The %RSD of the response factors over the working range of concentrations of the initial calibration will not exceed 20% for either volatiles or semi-volatiles (EPA SW 846, Update III, December, 1996).

- **Continuing Calibration.** Analyses of continuing calibration standards containing all volatile or semi-volatile Hazardous Substance List analytes will be performed daily.
- **Internal Standard Response and Retention Time Monitoring** Retention times for internal standards will not vary over 30 seconds from the last calibration check. The total area of the extracted ion chromatographic profile for internal calibration standards will not change more than a factor of two (-50% to +100%) from the last daily calibration check. If the above criteria are not met, the system will be checked for malfunctions and corrected.

5.2.2 Calibration Criteria for Gas Chromatography:

GC/PID/FID, GC/ELCD, GC/FID. The calibration standards for the methods involved in these analyses will go through full sample preparation and extraction procedures. A minimum of five standards and a blank will be required.

- An initial 5-point calibration (6-point for non-linear) will be performed on an as needed basis - when the instrument is shut down, or maintenance is performed. A linearity criteria required for GC and HPLC methods (other than GC/MS) will be 20% RSD.
- A mid-point continuing calibration verification (CCV) will be run at a minimum of one every twelve hours.
- One calibration standard will be at or below the reporting limit.
- The blank will be below the reporting limit for all analytes.
- For analyses of volatiles in solids, soil, and sludge, the calibration standards will be prepared in the same manner as for water. The standards will not go through the extra sample extraction of high level soils.
- End calibration verifications (CCV) will be run at a minimum of one every twelve hours.

Gas Chromatograph/Electron Capture Detector. A minimum of five calibration standards and a blank will be required. A mid-range CCV or a check sample and solvent blank will be run after every 10 samples. Specific calibration procedures are contained in individual analytical SOPs.

5.2.3 Calibration Criteria for Metals:

Atomic Absorption/ICP. AA and ICP spectrometers will be calibrated daily or after each start up according to manufacturers' specifications, with a minimum of one blank and one calibration standard for ICP and a minimum of one blank and three calibration standards for AA.

- Calibration acceptance criteria for FAA and GFAA will be linear –correlation coefficient $\geq$0.995; CVAA $\geq$0.997.
- CCBs and CCVs will be run at a rate of 10%.

5.2.4 Calibration Criteria for Wet Chemistry Methods:

pH Meter. Daily calibration with a pH 7 buffer and one of pH 4 or 10 will be required. Acceptance criteria for pH calibration is $\pm$0.05 pH units.

Conductivity Meter. Conductivity cells with platinum electrodes will be calibrated annually using a minimum of five concentrations of a KCl solution to establish the cell constant. Daily check with 0.01M KCl will be required. Statistical limits at 95% confidence level may be used.

Balances, Thermometers, and Conductivity Cells. Analytical balances will be checked daily with two Class S certified weights.

- Thermometers will be calibrated against an NIST certified thermometer once a year. The thermometer are checked at ice point and boiling point.

5.3 Equipment and Facility -

An integral part of STL San Francisco's quality assurance program is the internal support system which assures that equipment, facilities and supplies will be maintained and kept performing to specification at all times.

5.3.1 Equipment and Supplies.

Overall analytical system quality will begin with the timely acquisition of high quality equipment to assure efficient operation of the laboratory. STL San Francisco will purchase equipment and supplies that meet or exceed the specifications of the analytical methods. Glassware, reagents, gases and replacement parts for analytical instruments will be purchased from reputable suppliers with a history of quality customer service. All supplies will meet or exceed the specifications set forth in the method or of recognized professional groups such as the American Chemical Society (ACS), American Society for Testing and Materials (ASTM), and the Association of Official Analytical Chemists (AOAC).

5.3.2 Facilities, Safety, and Environmental Factors.

Factors in the environment of the laboratory affect the proper and safe functioning of equipment and the performance of analytical procedures. STL San Francisco's facility is designed and maintained such that the environmental specifications of the respective instrument manufacturers will be met. Safety and design features provide an environment conducive to efficient and effective work on the part of analysts.

5.3.3 Prevention of Cross-Contamination.

Design features which are intended to control cross contamination include the physical separation of extractable and volatile organics operations, the installation of hoods and air handling equipment in order to vent vapors out of solvent and sample handling areas, separate HV/AC systems for each operation, and segregated sample storage areas.

5.3.4 Sample and Reagent Storage Temperature Monitoring.

For storage of aqueous reagents and samples requiring refrigeration, all refrigerators will normally maintain an internal temperature of 1° to 4°C (34° to 40°F) throughout the compartment. For storage of organics dissolved in flammable materials, an explosion proof model will be used. Freezers used to store volatile organic standards will maintain an internal temperature of -10° to -20°C throughout their compartments. The temperature of each refrigeration unit will be recorded daily from in-place thermometers.

5.3.5 Reagent Water Quality.

Reagent, analyte-free or laboratory pure water means distilled or deionized water meeting the specifications of ASTM Type II reagent water and will have a conductivity of 100 μmho/cm or less. This water will be free of contaminants that may interfere with analytical test results.

5.3.6 Glassware Cleaning.

Glassware cleaning procedures will be posted in the glassware cleaning area. The glassware cleaning procedure will be documented in an SOP and meet EPA requirements. Only phosphate free, laboratory grade detergents will be used for the cleaning of glassware.

5.3.7 Cleaning of Sample Containers.

STL San Francisco normally purchases pre-cleaned sample containers for use by clients. These will be obtained from reputable container manufacturers. All sample containers and sample container cleaning procedures will meet EPA criteria, as certified by analysis.

5.3.8 Instrumentation.

Instrumentation will be continually upgraded in order to provide state-of-the-art technology. Instruments will be monitored through the use of daily calibration, sensitivity, and background checks to determine when nonscheduled maintenance is required. Preventative maintenance will be performed regularly to reduce the occurrence of instrument failure. In the event that an instrument does fail, every effort will be made to meet obligations to clients concerning holding times and analysis due dates.

5.3.9 Maintenance Log Books.

Dedicated logbooks will be used to document all instrument repairs and maintenance. The preventive maintenance procedures recommended by individual instrument manufacturers will be strictly followed (See Preventative Maintenance Schedule Table III). Maintenance log books will be kept for major pieces of equipment in the laboratory. Routine (preventative maintenance) and non-routine maintenance will be documented in these logs for future reference and will be kept near the instrument in order to keep track of scheduled maintenance. The minimum entry includes the date, task performed, and the initials of the person who performed the task. If an inspection leads to some further action, that will also be included in the entry. In the case of non-routine maintenance, troubleshooting, or repairs, the entry will include the problem, action, and resolution. Service records will be kept for all repairs and maintenance performed by outside technicians.

Table III
PREVENTATIVE MAINTENANCE SCHEDULE
METALS

Instrument	Frequency	Activity	Whom	Downtime
AA	as needed	clean up spill (asap)	analyst	
	daily (startup)	clean burner	analyst	
	daily (startup)	clean nebulizer w/50ml DI	analyst	
	daily (startup)	check acetylene tank (>100 psi)	analyst	
	daily (startup)	check acetylene pressure (8psi)	analyst	
	daily (startup)	check air pressure (60 psi)	analyst	
	daily (startup)	check waste receptacle	analyst	
	weekly	inspect hoses, leak test connectors	analyst	
	weekly	check nebulizer rate (4-6 mi/min)	analyst	
	monthly	wipe AA case down w/damp cloth	analyst	
	monthly	clean all optical windows w/ lens tissue & MEOH	analyst	
	monthly	check and clean all intake filters	analyst	
	yearly	replace O-ring in nebuilzer & burner head	analyst	
	yearly	PM visit from PE	PE Service	
Hg Analyzer	as needed	clean up spill (asap)	analyst	
	as needed	replace spent drying tube	analyst	
	daily (startup)	install fresh drying tube	analyst	
	daily (startup)	check pump tubing for wear	analyst	
	daily (startup)	check waste receptacle	analyst	
	daily (finish)	use overnight macro after use	analyst	
	daily	maintain supply of spare drying tube in air-tight container	analyst	
	monthly	lubricate auto sampler	analyst	
	monthly	wipe case down w/damp cloth	analyst	
ICP	as needed	clean up spill (asap)	analyst	
	daily (startup)	check nebulizer transfer line	analyst	
	daily (startup)	check argon and nitrogen tanks	analyst	
	daily (startup)	check gas flows on ICP	analyst	
	daily (startup)	check nebulizer aerosol	analyst	
	daily (startup)	check nebu. operating temperature	analyst	
	daily (startup)	check nebulizer cooling fluid level	analyst	
	daily (startup)	check waste receptacle	analyst	
	weekly	monitor Cu intensity and clean lens	analyst	
	weekly	clean torch	analyst	
	weekly	check and/or set up torch w/Y bullet	analyst	
	weekly	check and/or replace pump tubing	analyst	
	weekly	check intake screen on nebulizer cooling fluid	analyst	
	monthly	flush nebulizer	analyst	
	monthly	leak test all connectors	analyst	
	monthly	check ICP cooling water level	analyst	
	semi-annually	PM visit from PE technician	PE Service	
	semi-annually	clean all intake vents on ICP	analyst	

Table III con't
PREVENTATIVE MAINTENANCE SCHEDULE
GENERAL CHEMISTRY

Instrument	Frequency	Activity	Whom	Downtime
Balances	daily	calibration	analyst	
	annually	certify performance	outside service	
refrigerator	daily	check & record air flow	analyst	
hoods	monthly	measure & record air flow	analyst	
pH probe	daily	check electrolyte level	analyst	
IR spectro.	daily	clean cell window	analyst	
	4-6 weeks	archive data	service dept.	no effect
LIMS	as needed	re-indexing	service dept.	no effect
	as needed	network maintenance	service dept.	no effect
network	bi-weekly	backup data and run speed-disk	analyst	no effect
PE Nelson	daily	check gas tank pressure	service dept.	none
gases	daily	check gas delivery pressure	service dept.	none
	bi-weekly	drain condensation	service dept.	none
compressor	monthly	visual inspection + leak check (roof)	service dept.	none
	daily	check indicator lights	service dept.	none
DI water	daily	monitor resistivity reading	analyst	none
Millpore				

Table III con't
PREVENTATIVE MAINTENANCE SCHEDULE
SEMI-VOLATILES

Instrument	Frequency	Activity	Whom	Downtime
Diesel	as needed	replace column	analyst	
	as needed	replace carrier gas filter	analyst	
	weekly	wipe down syringe	analyst	
	weekly	flush waste drain line	analyst	
	weekly	replace septum (injector + a/s)	analyst	
	weekly	monitor flow rate, adjust or update	analyst	
	monthly	replace injector insert	analyst	
Pest/ECD	as needed	replace column	analyst	
	as needed	replace carrier gas filter	analyst	
	as needed	clean ECD foil	outside service	
	weekly	monitor flow rate, adjust or update	analyst	
	weekly	check & record column pressure	analyst	
	weekly	check & record detector noise level	analyst	
	weekly	flush waste drain line	analyst	
	weekly	replace septum (injector + a/s)	analyst	
	monthly	replace guard column	analyst	
	tri-annually	wipe (leak) test of ECD	analyst	
GC/MS semi	as needed	replace column	analyst	
	weekly	check/replace carrier gas filter	analyst	
	weekly	check air/water ration	analyst	
	weekly	flush waste drain line	analyst	
	as needed	replace septum	analyst	
	monthly	replace insert, clean injector	analyst	
	semi-annually	clean source and ion trap	analyst	
	semi-annually	change pump oil	service dept.	
	semi-annually	lubricate turbo pump bearing	service dept.	
	semi-annually	clean/replace a/s sealing disc	service dept.	

Table III con't
PREVENTATIVE MAINTENANCE SCHEDULE
VOLATILES

Instrument	Frequency	Activity	Whom	Downtime
Gas/BTEX	as needed	replace column	analyst	
	as needed	clean/replace PID lamp	analyst	
	as needed	replace carrier gas filter	analyst	
	weekly	check & record column pressure	analyst	
	weekly	monitor flow rate, adjust or update	analyst	
	bi-weekly	purge system w/MeOH solution	analyst	1 weekend
	quarterly	replace Tekmar trap	analyst	
GC/MS vol.	as needed	replace column	analyst	
	weekly	check/replace carrier gas filters	analyst	
	weekly	monitor air/water ratio	analyst	
	bi-weekly	purge system w/MeOH solution	analyst	1 weekend
	as needed	check "septem"	analyst	
	quarterly	clean source and rods	analyst	
	quarterly	replace Tekmar trap	analyst	
	semi-annually	replace "septem"	analyst	
	semi-annually	change vacuum pump oil	service Dept.	

6.0 Corrective Action: Analytical /Systematic

STL San Francisco has established and implements systematic procedures when analytical performance does not meet defined standards and data quality objective is not achieved. These procedures are called Corrective actions that restore proper functioning to the analytical systems and are categorized as either **analytical** or **systematic**. An essential part of the corrective action process is communication and awareness of the problem, the cause, and the action taken to prevent future occurrences and/or rectify the immediate problem.

6.1 If the corrective action is **analytical**, the analyst will initiate the action and correct the error within the department. These are common everyday occurrences, such as instrument drift or QC outliers. The corrective action steps will be documented on a "Corrective Action" report (Figure 6-1) by the chemist who initiated the corrective action. Validation of the report is indicated when dated signatures of the chemist, the Team Leader and a member of the QA department are obtained. Signatures of Project Managers are required for Level III and IV data packages or when the Project Manager is directly involved in the corrective action process. The original corrective action report will be maintained within the QA Department and assessed for trend analysis and verification of a closed loop: corrective actions have been implemented, confirmed as effective and communicated. A copy of the corrective action report will be filed in each applicable project folder.

Corrective action for analytical deficiencies is supplemented by QC narration in LIMS during data entry and QA narration using the Laboratory's internal e-mail.

6.1.1 Corrective action involving analytical **QC sample outliers** is defined in individual method SOPs. Typically, the following procedures will be implemented whenever quality control samples fall outside limits:

- **Method Blank.** When an analyte is detected above the reporting limit in the method blank, each sample in that batch is reviewed for the particular analyte(s). If the sample analyte is less than the reporting limit or greater than ten times concentration of the method blank level, the sample result is reported. If the analyte is between the reporting limit and ten times the method blank level, the sample is re-prepared and reanalyzed. Corrective action is amendable for Project specific requirement (i.e., detectable levels of target compounds that warrant corrective action may vary).

  When contamination occurs, immediate measures are taken to locate, correct and eliminate the source of contamination. Additionally, samples that are known to have high levels of target analytes as a result of analysis or profile are removed from the general population and placed in an auxiliary, controlled sample receptacle.

- **Laboratory Control Standard (LCS) and Matrix Spikes.** Corrective action for failure of LCS sample or matrix spike recoveries depends on the relationship between accuracy and precision. Failure of the LCS for accuracy will require re-preparation and reanalysis. Failure of duplicate samples for precision will be evaluated on a case by case basis in terms of prep batch verification of precision and data usability. For example, if a prep batch includes both an LCS/LCSD and MS/MSD, accuracy and precision can be verified by either set with the stipulation that the acceptance criteria (control limits) are identical for both.

  Accuracy and precision achieved by MS/MSD analysis will also be evaluated on a case by case basis in terms of difficult matrices, exceeded spike concentration, or sample heterogeneity. If analytical results indicate either of such conditions and provides reasonable explanation for QC failure, re-preparation is not warranted; however, corrective action documentation is required. Matrix spike analysis and criteria is amendable to project specific requirement.

- **Surrogates (Organic analysis).** Corrective action for surrogate recovery that does not meet acceptance criteria must be evaluated for effect indicated for field and QC samples. Recovery for surrogate spikes in matrix specific-samples that fail to meet stipulated acceptance criteria may indicate a potential matrix effect. It is the policy of the laboratory to confirm matrix effect by reprep and reanalysis of the sample(s) in question, especially for surrogate recovery that fails low. If the presence of significant non-target interference yields failed surrogate recovery, reprep may not be warranted (e.g., high surrogate recovery due to co-elution). Analytical corrective action for matrix interference may include additional clean up (e.g., copper clean up for the presence of sulfur in PCB extracts) or diluted analysis. Since surrogates are chosen and used to reflect the chemistries of the targeted compounds of the method, LIMS flagging conventions and corrective action documentation are required when reporting sample data with surrogate recovery outside of control limits. Client profile and sample history must also be taken in consideration.

  Failed surrogate recovery for any QC sample requires reprep and reanalysis of the samples associated with the prep batch. Additionally, reprep and reanalysis is required for those samples that fail surrogate recovery and matrix interference is not indicated.

6.1.2 Corrective action involving analytical continuing calibration verification (CCV) during the analysis of QC and field samples will be evaluated against current methodology established by the EPA guidance or Project specific requirement. All

CCVs that do not meet method requirement shall result in review of the calibration, rerun of the calibration standard, and, if necessary, reanalysis of all samples affected.

Data can be reported under the following conditions when CCV criterion has been exceeded:

- The closing CCV demonstrates increased sensitivity and bracketed samples are non detect.
- Limited sample volume or holding time has exceeded which prevents re-prep/reanalysis.

In both cases, corrective action documentation and narration is required. If reprep/reanalysis cannot be performed, it is imperative to contact the responsible Project Manager prior to data reporting; who must contact the client for data reporting options.

An analysis of an initial calibration may be necessary, and documentation of maintenance for restoring the instrument to optimal running condition is essential and required.

6.2 If the Corrective action is **systematic**, the nature of the errors or deficiencies is more complex and may require the immediate attention of the Lab Director. Examples of systematic errors or non-conformances are listed below:

- Deviation from Standard Operating Procedures or Method guidance as determined by technical or systematic audit conducted internally or externally
- Instrument or equipment issues
- Consecutive failure of Performance Evaluation samples.
- Repeated failure of QC samples and measurement quality objectives or undesirable trends are indicated by analytical corrective action trend analysis.

The corrective action objective of systematic discrepancy or non-conformance is resolution by identification of root cause and prevention of recurrence: successful implementation of corrective action steps and robust documentation. When the root cause of a persistent problem cannot be immediately identified, it is essential that the corrective action process embarked upon must be a collective, problem solving, constructive effort where all parameters are examined. Once the root cause of the problem is identified, pertinent staff and department(s) examine potential actions that will rectify the problem, and prevent recurrence of future or similar occurrences. Description of problem, identification of root cause, steps of corrective action and measures to prevent recurrence is documented on STL San Francisco's Non-Conformance report (figure 6-2).

The non-conformance report is dated and signed by the following personnel: the chemist who initiated the non-conformance, Team Leader(s), and Lab Director. QA will acknowledge the date when corrective action has been implemented. After implementation of corrective actions, QA will monitor their effect to determine if the actions taken have been effective in overcoming the non-conformance identified. Target audits and surveillance will accomplish monitoring. Verification of non-conformance closure will be acknowledged and dated by QA. Copies of the verified non-conformance report will be distributed to applicable personnel and project file. The original report will be retained in QA as a quality record.

6.3 Stop Work Authority -

The Quality Assurance Department has the authority to stop activities that in the opinion of the Quality Assurance Department are uncontrolled or nonconforming and could affect the quality of the overall project or jeopardize quality objectives if not corrected. Stop work actions will be coordinated through the Laboratory Director and the Team Leader. Stop work actions will be implemented when nonconformance issues cannot be resolved or when conditions become unsafe and dangerous.

Figure 6-1

STL-San Francisco Corrective Action Report

Initiator: ______________________

Date: ______/______/_____

Parameter/Analysis: ____

Matrix: ☐ Soil ☐ Water ☐ Other: ___________________________

Submission #(s): ____

Sample #(s)____

____

____

Batch-#(s) ____

____

____

Category of discrepancy

☐ Sample Prep
☐ Sample analysis
☐ Data Reporting
☐ Identify Instrument if applicable:

____

☐ Other (describe below):

Discrepancy Description:

Sample Prep: ☐ Hold Time Exceeded ☐ Wrong Sample pulled ☐ Wrong Spike ☐ Other (describe below)

Sample Analysis ☐ CCV failed- O Initial O Mid O End ___High/___Low
☐ Method blank- O Contamination greater than ___RL/___MDL
☐ Surrogate Recovery (Identify/narrate below if more than 1 surr.)-O High O Low O Missing
☐ LCS/LCSD Recovery- O High O Low O RPD out O Missing
☐ MS/ MSD Recovery - O High O Low O RPD out O Missing O Spk. Conc. exceeded
☐ MS/MSD not performed due to insufficient sample volume O LCS/LCSD verified P/A
☐ Other (describe): ____

____

____

____

(use space on back if more text is needed and indicate with: → over)

Corrective Action taken:

☐ None- O Insufficient sample/extract volume O Out of hold O Co-elution indicated O Narrate below
☐ Reanalyzed extract/sample- O Similar results yielded / ___ Matrix effects indicated
☐ Re-extraction/Re-prep
☐ Other (describe): ____

____

____

Preventative Action/Recommendation: ____

____

____

(use space on back if more text is needed and indicate with: → over)

Approval and Distribution of <u>Completed Corrective Action Report</u>:

<u>Initiator</u>	___________________________	Date: _____/____/____
<u>Team Leader</u>	___________________________	Date: _____/____/___
<u>Project Manager</u>	___________________________	Date: _____/____/ ___
<u>Quality Assurance (original)</u>	___________________________	Date: ____/____/ ____

Figure 6-2
STL San Francisco
Nonconformance Report

Page 1 of 1

Submission # :	Department:	Date:	NCR #:

Nonconformance Description (include specific discrepancy and requirement reference)

Identified by:

Root Cause of Nonconforming Condition (included applicable trend or reference to drift)

Corrective action to be taken (include applicable training and reference; dates of action and completion)

Action or measures to be taken to preclude recurrence:

	Department (Team): ________________	**Date:** _____
Acknowledgement {	**Team Leader:** ______________________	**Date:** _____
	Laboratory Director:_________________	**Date:** _____
	Quality Assurance: ________________	**Date:** _____

Corrective action Completed by/Date	Verification Completed by/Date

forms\ncr temp 2002.doc

7.0 Document Control and Distribution

Documents developed to direct, instruct, and/or guide technical or quality affecting activities will be maintained and controlled. Documents such as QAMs, QAPPs, and SOPs will be uniquely numbered and distributed to individuals or groups that have been identified as copy holders. The documents will be controlled and distributed in accordance with SOP #12.13.

7.1 Quality Assurance Manual and Standard Operating Procedures (SOPs) -

Distribution of these documents will be authorized by the Laboratory Director or Project Managers and coordinated through the Quality Assurance Department.

Distribution of the Quality Assurance Manual and SOPs will be performed using "Document Receipt Acknowledgment" forms (Figures 7-1 & 7-2) which require receipt acknowledgment by an individual or organization of the controlled document or subsequent revisions. The distribution of controlled documents will be tracked on a Document Distribution list. All documentation and correspondance regarding controlled documents will be maintained within the Quality Assurance Department.

7.2 Client and Laboratory Communication

The laboratory establishes a requirement of maintaining a formal system for documenting project/program specific needs provided by the client, and communicating pertinent information to the laboratory for successful execution of analytical methods. The objective of the laboratory is to provide clients valid, defensible data. STL San Francisco recognizes that meeting this goal begins with efficient, timely, and organized project management. Section 2.5 details the responsibilities of the project manager. The laboratory is aware of the availability of numerous methods and analytical techniques, and that continued communication between the laboratory and the client is fundamental to assure that correct, justified methods are used. Project management will also ensure that any communicated client concerns or changes in requirement during sample receipt and the span of the project are conveyed and properly addressed by the measures and tools of communication. SOP 02.12: Sample Handling - Client and Laboratory Communication Protocol, describes a formal system of this subject.

Figure 7-1

DOCUMENT RECEIPT ACKNOWLEDGMENT

THE FOLLOWING CONTROLLED COPY
Copy No.:________________________

OF DOCUMENTS WHICH COMPRISE THE STL SAN FRANCISCO QUALITY PROGRAM OR PORTIONS THEREOF ARE BEING TRANSMITTED FOR YOUR IMPLEMENTATION AND USE. PLEASE SIGN/DATE THIS DOCUMENT TRANSMITTAL ACKNOWLEDGING YOUR RECEIPT OF THE DOCUMENT(S) LISTED BELOW AND TO ENSURE YOUR STATUS ON THE CONTROLLED DOCUMENTS HOLDERS LIST.

DOCUMENT NAME: QUALITY ASSURANCE MANUAL

DOCUMENT REVISION:_______

NOTE: PLEASE DESTROY REVISION _____ IN ITS ENTIRETY AND REPLACE WITH ATTACHED REVISION.

ISSUED TO - DEPARTMENT / ORGANIZATION:_____________________________

I HAVE RECEIVED THE ABOVE LISTED DOCUMENTS

Name (Printed):____

Name (Signed):____

Company Name/Office:____

Date Received:____

PLEASE COMPLETE THIS RECEIPT AND RETURN TO:

STL San Francisco
Quality Assurance Department
1220 Quarry Lane
Pleasanton, CA 94566

Figure 7-2

Acknowledgment of Receipt
for
Standard Operating Procedures (SOPs)

SOP #	TITLE	REV	DATE

Fill in name of person receiving SOP *Fill in control #*

Issued To: Control #:

The signature below confirm that the SOPs listed above have been received:

Fill in signature of person receiving SOP *Fill in date signed*

___________________________________ Date___________________

8.0 Personnel Training and Qualifications

Training is provided to all new employees in their fields of assignment to ensure their ability to carry out job functions. Trainers are designated by the Laboratory Director. The program consists of two phases, Initial Training and Continuing Training. Training will be documented and maintained in an employee training records file as part of the Quality Assurance Program (Fig. 8-1, Method or Task Training Form, Fig. 8-2, Technical Training Form, Fig. 8-3, Certification Form for analysis of Performance Sample).

8.1 Initial Training and Development Programs

All employees must demonstrate initial competency prior to assumption of their assigned duties based on the following criteria:

- Orientation of job functions and how it interacts with the overall organization.
- Receive training or supervision in the method by a qualified person prior to performing technical work.
- Passing a written and/or oral examination by a qualified analyst or manager.
- Perform and pass an appropriate Performance Evaluation(PE) sample.
- Perform an appropriate Method Detection Limit Study (MDL).
- Receive an orientation of the QA program.
- Receive an orientation of the Health & Safety program.

8.2 Continuing Training -

Continuing Training is performed at scheduled times to assure certification revisions are current and changes to laboratory SOPs and other protocols are communicated. All analysts must be **recertified** annually for all analyses they run routinely by passing an in-house performance evaluation sample at a minimum and must also be certified before performing commercial analyses for any method they have not run routinely for a period of one year or longer.

Continuing training is based on two criteria, in-house training and off-site training:

8.2.1 In-house Training

- Acceptable review of the method with an experienced analyst or Operations Manager.
- Acceptable performance on an appropriate PE sample.

8.2.2 Off-site Training includes seminars, workshops, job related academic classes.

8.3 Health & Safety Training -

STL San Francisco maintains a Health and Safety (H & S) training program that is required of all employees. New employees are instructed in basic H & S policies and practices during orientation. Scheduled H & S meetings reinforce good safety practices and expand all employees awareness of H & S issues. Employees (such as sample disposal technicians and couriers) who may be exposed to potentially serious Health and Safety issues may be required to participate in additional OSHA training. The Safety Officer maintains written safety records for each employee who has been trained on safety issues.

8.4 Quality Assurance Training -

STL San Francisco maintains a Quality Assurance (QA) training program that is required of all employees. New employees are instructed in basic QA policies and practices during orientation. Weekly department meetings are held to review Quality issues, new methodologies, or upcoming audits.

Figure 8-1

EMPLOYEE TRAINING RECORD

ASSIGNMENT:____
(Method or General Task)

REFERENCES:____

____
(List all SOPs pertaining to Method or Task)

EMPLOYEE NAME (TRAINEE): ______________________________

TRAINER(s) NAME: ______________________________________

Training Assignment			
As each assignment is completed for the task listed above, fill in date and initial. When training is completed, return this form to the QA/QC Dept. for record updating.	**Date Complete**	**Trainee Initials**	**Trainer Initials**
Has received all references listed above.			
Has read all references listed above.			
Can correctly answer oral and/or written questions for the references listed above.			
Knows proper documentation procedures for recording information for this task, including reporting of data generated.			
Can demonstrate preventive maintenance techniques for equipment used in task.			
Can operate the required instrumentation as prescribed by the Manufacturers' Manuals and SOPs.			
Knows all Quality Control requirements, including Corrective Actions. Can demonstrate these steps.			
Has satisfactorily performed the task in accordance with SOPs or specified Policy Directives.			

Figure 8-2

EMPLOYEE TRAINING RECORD

ASSIGNMENT: ____

(Method or General Task)

REFERENCES: ____

(List all SOPs pertaining to Method or Task)

EMPLOYEE NAME (TRAINEE): ____

TRAINER(s) NAME: ____

Training Assignment			
As each assignment is completed for the task listed above, fill in date and initial. When training is completed, return this form to the QA/QC Dept. for record updating.	Date Complete	Trainee Initials	Trainer Initials
Has received all references listed above.			
Has read all references listed above.			
Can correctly answer oral and/or written questions for the references listed above.			
Knows proper documentation procedures for recording information for this task, including reporting or data generated.			
Can demonstrate preventive maintenance techniques for equipment used in task.			
Can operate/properly calibrate the required instrumentation as prescribed by the Manufacturers' Manuals and SOPs.			
Can demonstrate traceability and preparation of all standard solutions and reagents used.			
Knows calibration/quality control requirements, including corrective actions. Can demonstrate these steps.			
Has received Health and Safety training, and can demonstrate proper techniques of waste disposal as required and documented in QAM and laboratory Chemical Hygiene Manual.			
Has correctly and accurately analyzed Reference Materials (PE/PA samples) in accordance with methodology.			

Figure 8-3

Performance Evaluation Study (PES) Summary

Next Certification Due:

Analyst Name: Date:

EPA Method/No.: SOP No.:

Instrument: Standard:

Submission No.: Sample No./Type:

PES CLASSIFICATION: ☐Initial Continuing

PERFORMANCE:	Accept ?	Yes	No
Calibration Run		______	______
Sample Prep By:	Date:	______	______
SOP Available		______	______
Standard Record Correct		______	______
Start-Up Procedure		______	______

EVALUATION:

Compound	Reported Result	Certified Value	Acceptance Limits

(See addendum for multi-component tests)

Performance Results Pass ____ Fail____

Comments / Corrective Action (if applicable):

____

____

______________________________ ____________________

QA Signature Date

9.0 Control of Purchased Items and Services

9.1 Procurement -

The procurement of items and services are controlled to meet the following quality requirements set by the Corporate Management:

- Appropriate technical and quality requirements are adequately specified in purchase orders (PO).
- Sufficient reviews and approvals are received prior to procurement to verify project objectives are reflected in the procurement
- The procurement process accurately transmits requirements to suppliers and subcontractors
- Selected suppliers and subcontractors are qualified.
- Items and services conform to quality assurance, commercial, and technical procurement requirements.

9.1.1 Procurement Document Control -

Procurement documents issued by STL San Francisco including bid requests, purchase orders, and contracts will be prepared, reviewed, and approved as described in STL San Francisco Standard Operating Procedures. Bids and contracts will be reviewed and documented by the Laboratory Director, Project Manager, Quality Assurance Department, and/or MIS Manager, as appropriate, prior to initiation of documents.

9.1.2 Purchase Requisitions -

The Department Team Members will be responsible for requesting items or services affecting their department. The Quality Assurance Department and Laboratory Director will review and approve the technical and quality requirements for the item(s) or service(s) to be supplied. All Laboratory purchases will be controlled by logging, numbering, and monitoring revisions so that the information issued and used is current.

Vendors will furnish appropriate documentation of chemicals, equipment, and supplies that must be submitted upon delivery of merchandise. Subcontractors will be prequalified and required to furnish documented evidence of their capabilities to perform laboratory analyses prior to commencing work. The

Quality Assurance Department or Laboratory Director are responsible for auditing subcontract laboratories.

9.1.3 Procurement Documentation Revision

Revision(s) to procurement documents which have been issued will be initiated using the same method as the original procurement and will be approved

9.2 Reagents -

All chemicals will be inspected for container integrity upon receipt. The date of receipt and lot number will be recorded in a log book within each department. All chemical certificates will be kept on file within each department.

A control system for batch testing chemicals is followed. The lot numbers will be recorded and the solvents tested for the analytes of concern. The tests must meet the purity criteria before the chemicals are distributed within the laboratory. Whenever possible, STL Corporate will arrange with the manufacturer to reserve those lots of solvent already tested and approved.

To ensure freedom from contamination, all reagents used will be the purest grade required for a particular analysis. For most analyses, Analytical Grade is satisfactory. All organic solvents are pesticide-grade or equivalent. Preparation of reagents is documented and includes preparer, lot number or documented reference code, dilutions, date prepared, and expiration date. Solvents and reagents are routinely checked for contamination by analyzing them as method or instrument blanks for the analytical methods for they are used.

Reagents will be stored in accordance to manufacturer's directions, in appropriate containers and conditions to maintain safety and integrity.

9.3 Standards -

All standards - calibration, spiking, surrogate and internal - will be purchased from suppliers with certification of purity and concentration and stored in each department by receipt dates. They will be inspected and tested against previously validated standards. Suspect standards will be returned to the vendor. The date of receipt, source, lot number, expiration, assigned lab ID number, and person receiving it will be recorded in a standards logbook maintained within the Quality Assurance department. The lab ID number and the expiration date will be recorded on the standard container.

All working standards will be traceable to the neat standards by documenting the neat ID number in the standard preparation logbook. Additionally, the logbook will include the preparation date, amount of neat standard used, final volume, concentration of each compound used, solvent used, expiration date, and preparer. The working standard will be given a lab ID number which is entered on the container label along with the standard name, date prepared, preparer, and expiration date.

Organic standards will be stored in dedicated freezer/refrigerators maintained at -10°C to -20°C for volatile standards and 4° ± 2°C for all others. Refrigerator temperatures will be monitored and documented in a logbook daily. Metals standards will be kept at room temperature.

9.4 Sample Bottles -

Each lot of sample bottles purchased will have a certificate of analysis which is logged in a binder and maintained in Sample Control. Sample bottles will meet EPA specifications and will not be reused.

9.5 Glassware Cleaning -

Glassware cleaning procedures are documented in SOP #13.03. All glassware will be washed with phosphate-free detergent and stored in a closed, contaminant-free area.

9.5.1 Volatile Organic Glassware will be scrubbed in detergent and hot water. It will be rinsed thoroughly with hot tap water, then three times with DI water. The glassware will be oven dried at 150° C. Syringes and small items will be cleaned by rinsing with methanol.

9.5.2 Extractable Organic Glassware will be rinsed with acetone only if samples left an oily residue or other residue that cannot be cleaned with detergent and water. It will be rinsed with hot tap water, scrubbed with detergent and water, rinsed with hot tap water, then rinsed three times with DI water. It will be oven dried at 150°C. Prior to use, it will be rinsed with the solvent to be used for extraction.

9.5.3 Inorganic Glassware will be rinsed with hot tap water, scrubbed with detergent and hot water, rinsed with hot tap water, then three times with DI water, oven dried at 150°C, and stored. Prior to use, metals glassware will be rinsed with 2% nitric acid.

9.6 Laboratory Water -

Deionized water (ASTM Level II) will be used throughout the laboratory. Milli Q water treatment systems will be used in the volatile organic and metals preparation areas for increased purity.

The quality of water will be monitored routinely against acceptance criteria and will be referenced in an appropriator standard operating procedure. Minimum monitoring will consist of conductivity measurement and analysis of method blanks.

Maintenance of the water system will be performed on an "as needed" basis through monitoring. Logbooks will be maintained for recording all monitoring results and maintenance work performed.

9.7 Subcontracted Laboratory Work -

Only approved laboratories will be used for subcontracted analyses. For certain projects, subcontracted laboratories must be approved by the program

Instructions will be documented on a chain-of-custody that is sent with the samples to the subcontracted laboratory. When the subcontracted work is completed, the report will go through the same review and approval process as is conducted for in-house data evaluation.

9.8 Inventory Tracking -

Inventories of purchased items will be monitored and maintained by the accounting department. Each department will be responsible for maintaining an adequate inventory.

10.0 Laboratory Procedures and Reviews

10.1 Standard Operating Procedures (SOPs) -

The process for the preparation, review, approval, issuance, and revision of these documents is contained in STL San Francisco SOP #1.00. All SOPs will be assigned a unique number, revision date, and title. Prior to issuance, the document will be reviewed and approved by the Laboratory Director, Technical Reviewer, and Quality Assurance Department. The reviewers will verify that the following criteria are met:

- The procedure conforms with the department and laboratory process.
- Regulatory requirements are met.
- Client requirements are met.

Final approval requires the date and signatures of the Technical Reviewer, Laboratory Director, and Quality Assurance.

10.2 Method Performance Policy

Method performance data will be determined before each method is used in the laboratory and will be completed within thirty working days (However, some methods may require a longer period.). The Quality Assurance Department will be notified if a new method is to be implemented to STL-San Francisco's list of analyses. The Quality Assurance Department will recommend appropriate procedures to be evaluated by the Laboratory Director. Following evaluation, an SOP based on approved methods, such as EPA, will be drafted and sent in for review by the QA Department. If the draft SOP is in order, the analyst will be trained. The performance evaluation will proceed in the laboratory.

Initially, the analyst will generate a calibration curve for the analytes of interest. The concentration levels of the calibration standards will demonstrate the ability to meet the method detection limit (MDL). Furthermore, a second source standard will be analyzed to verify the standard used for calibration. If the calibration curve meets method requirements, an MDL study will then be carried out in accordance with SOP #12.03.01. Precision and accuracy studies will be run in accordance with SOP #12.03.03, followed by a performance sample, if applicable. Once the studies have been completed with all the data compiled and accepted, all summary results with supporting raw data will be submitted to QA for final review and approval. Only following approval by QA will the new method be considered acceptable, ready for analysis of samples, and will be submitted for certification/validation from certifying agencies, if applicable.

10.3 Data Review -

Data review involves the checking of data quality and documentation. It also requires dated and signed entries on worksheets and logs used for samples, use of sample numbering systems to track samples through the process, and the use of quality control criteria to accept or reject specific data. All data are reviewed, signed, and dated by the analyst and a qualified chemist prior to issuing a final report. Data review procedures are discussed in SOPs #11.02 & 11.03. Additionally, Level III & IV data packages are reviewed, signed, and dated by the Project Manager and the Quality Assurance Department.

Non-compliance issues will be returned to the applicable department analyst where appropriate action will be taken. Changes will be marked-through with one line, initialed, and dated.

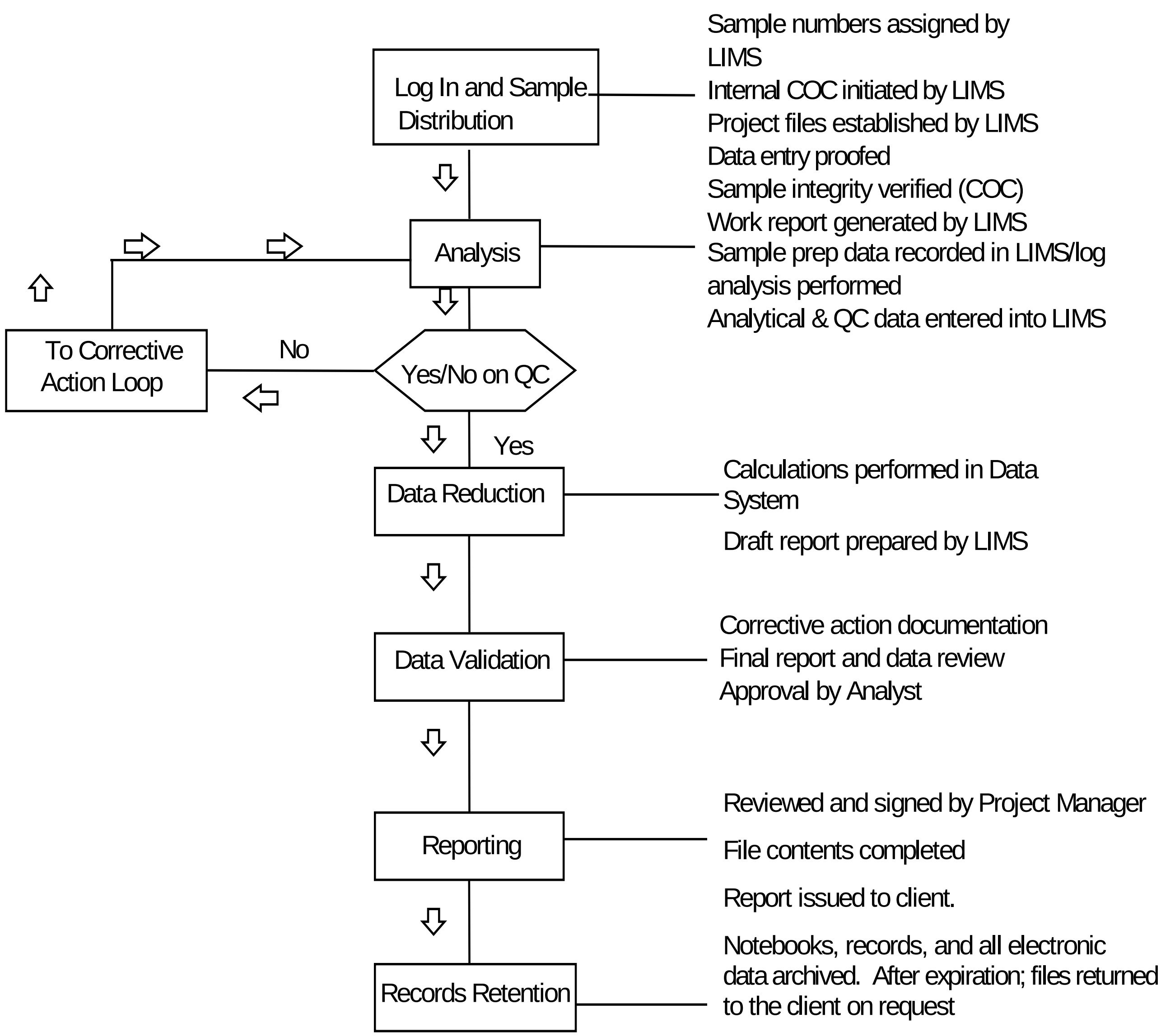
10.4 Computerized Data -

Computerized data collection and handling systems used by STL San Francisco will assure that each data entry and file is uniquely identified so that data can be reliably stored and retrieved without loss. In addition, all data files will be supported by hard copies.

It is the responsibility of the Laboratory Director to ensure that computer personnel are sufficiently trained in order to prevent data corruption, that computer software is validated, and that levels of security clearance for software access are implemented.

It is the responsibility of the Quality Assurance Department to assure that processes are being implemented and upheld through laboratory system audits.

Figure 10-1
STL SAN FRANCISCO DATA FLOW CHART



11.0 Laboratory Audits

Audits measure the laboratory's quality performance, determine the effectiveness of the implemented quality system elements in meeting specified quality objectives, and ensure compliance with the various certification programs.

Audit assessment serves as a management tool by providing important information to ensure that collected data are defensible. Overall, audits lend to the continuous improvement and dynamics of the Laboratory's Quality System.

The laboratory undergoes and is subjected to **Internal** (System, Data, and Special) and **External** audit process.

11.1 Internal Audits

11.1.1 Systems Audits

Systems audits are technical by nature and are used to verify by examination and evaluations of objective evidence, that applicable elements of the quality system have been developed, documented, and effectively implemented in accordance and in conjunction with the requirements specified within this QA manual.

Systems audits are conducted on an ongoing basis. Audits for each department, both operational and support, shall be performed not less than annually.

Upon completion of the audit, the QA Manager will issue an audit report addressed to the Team Leader of the audited department within 21 working days. A copy of the report is sent to the Lab Director.

Written audit responses are required within 21 calendar days of audit report issue. The audit response follows the format of the audit report, and corrective actions and time frames for their implementation are included for each deficiency. The audit response is directed to all individuals copied on the audit report. Where a corrective action requires longer than 21 days to complete, the target date for the corrective action implementation is stated and evidence of the corrective action is submitted to the QA Department in the agreed upon time frame. Closure of the audit is verified by QA.

11.1.2 Data Audits

Data audits are focussed to assess the level of customer service, method compliance, regulatory compliance, accuracy and completeness of test results and reports, documentation, and adherence to established QC criteria, laboratory SOPs, technical policy, and project specific QC criteria.

A data auditing frequency target of 10% has been established. Level III and IV data packages are subjected to 100% QA review. The QA Department provides feedback and/or corrections and revisions to project reports where necessary. Data audits must include electronic reproducibility of selected raw data (e.g., reproducing area at selected retention time); LIMS data entry review; adherence to graphic edit or manual integration policy; approach to the analytical sequence conforms to guidance and SOP; verify demonstration of secondary and peer review, and confirm that Project specific requirement have been met.

Records of the data audits shall be kept, and the frequency of data audits shall be included in the monthly QA report. In performing data audits, it is essential that data be assessed in terms of differentiating between systematic and isolated errors. Upon noting anomalous data or occurrences in the data audits, the QA Department is responsible for seeking clarification from the appropriate personnel, ascertaining whether the error is systematic or an isolated error, and overseeing correction and/or revision of the project report if necessary. Errors found in client project reports are revised and the revision sent to the client. The QA Department is also responsible for assisting in the corrective action process where a data audit leads to identification of the need for permanent corrective action.

11.1.3 Special Audits

Special audits are conducted on an as needed basis, generally as a follow up to specific issues such as client complaints or data concerns, corrective actions, proficiency testing results, data audits, systems audits, validation comments, or regulatory audits. Special audits are focussed on a specific issue. Report format, distribution, and timeframes are designed to address the nature of the issue. Audits of this nature may also serve to accelerate or augment personnel training.

11.2 External Audits

STL San Francisco is routinely audited by clients and external regulatory authorities. The lab is available for these audits and makes every effort to provide the auditors with the personnel, documentation, and assistance required by the auditors. The auditing agency will arrange on-site schedules, and set timeframes for the laboratory's response to findings or comments. STL San Francisco recommends that the audits be scheduled with the QA Department so that all necessary personnel are available on the day of the audit.

12.0 Records Management

Accurate records on a project are essential for current and historical purposes and must meet regulatory and liability issues. STL San Francisco's documents are retained and stored in such a manner that meets client, project, and legal requirements. To demonstrate that quality has been achieved, STL San Francisco will maintain a records management system that includes documents that are specific to a project or a group of samples within an ongoing project and those that demonstrate overall laboratory operations. The records management system implemented will provide data that is secure, complete, and easily retrievable. All laboratory records from the time of sample receipt through reporting and disposal of samples will be available and stored in a manner that safeguards their integrity from tampering or physical damage or loss. All documentation that is associated with a given project will be available for review by STL San Francisco and its clients. This documentation includes associated operational and project specific data generated by the laboratory.

12.1 Current Records -

The laboratory will assign a Document Controller responsible for the records management system. This individual will initiate new project files, update files as necessary with additional information, and assist laboratory personnel in withdrawing and returning records. To maintain control of these records within the laboratory, an "archival request" file will be maintained. This file will contain at a minimum the project file check-out, file designation, date check-out, person borrowing records, and date returned to files. Retention of records will be in accordance with contract or appropriate regulatory requirements.

12.2 Laboratory Logbooks -

The Quality Assurance Department shall issue a control number for every laboratory notebook, log, and working record used by the laboratory and maintain a record of the use and archival of such documents. These documents include instrument logs, calibration logs, refrigerator temperature logs, deionized water logs, instrument maintenance logs, extraction and run logs, and standard logs.

In most cases, laboratory logbooks will be bound and given a control number upon disbursement. Each page will be numbered. When these logs are completely filled and no longer used, they will be returned to and archived by the Quality Assurance Department.

12.3 Telephone Logbooks -

Telephone logbooks will be dispersed to those employees who have contact with project management, such as Project Managers, Laboratory Director, Quality Assurance Department, and Business Development. Notebooks will be bound and given a control number upon disbursement. Each page will be numbered. When these logs are completely filled and no longer used, they will be returned to and archived by the Quality Assurance Department.

12.4 Records Storage -

12.4.1 All **analytical records** will be kept for at least **five years**. They will be kept in files in the work area as long as they are actively used, after which they will be stored in secure central storage. Electronic results of chromatograms and test results in LIMS will be archived and stored in the computer room.

12.4.2 Client's reports and project files will be stored for at least **five years**. They will be kept by Client name in secured central office files for one year, and then in secure central storage. They will be disposed of in a confidential manner. Prior to disposal of records, key clients will be contacted and given the option of transferring the records to their possession.

12.4.3 All **Quality Assurance records** will be stored in the Quality Assurance Department. Documents detailing custody of instrument logbooks and bench sheets, QA Manuals, and the like will be stored with the Quality Assurance Department.

12.4.4 Accounting documents will be retained for five years. Ledgers will be kept both in hard copy and in electronic format. Accounting records will be held in a separate storage area reserved for the Accounting Department.

Retention periods, type of archival, location, and responsible party of all records are listed on the "Document Storage" (Table IV, page 12-3).

Table IV
Document Storage

	Hardcopy Records		Electronic Records		
	Retention Period	**Location**	**Retention Period**	**Medium**	**Location**
Laboratory Reports					
Chromatograms	5 Years	Central Storage	5 Years	Optical Disk	Computer room
Chemists' Bench Sheets	5 Years	Central Storage			
Chemists' Lab Notebooks	5 Years	Central Storage			
Instruction & Run Logs	5 Years	Central Storage			
Sample Control					
Technician Sample Requests	6 Months	Sample Control			
Internal Sample Logs	5 Years	Central Storage			
Job check Review Forms	2 Months	Project Manager			
Clients' Reports & Project Files					
Reports	5 Years	Central Storage	5Years/LIMS	Optical Disk	Computer Room
Project Records	5 Years	Central Storage	5 Years/MS Word & WP	Floppy Disk	Record file
Electronic Deliverables			5 Years/Military	Floppy Disk	
			5 Years/Commercial	Floppy disk	Network Backups
Chains of Custody	5 Years	Central Storage			
QA Records					
Bench Sheet Check Out Log	5 Years	Central Storage			
QA Manual Check Out Log	5 Years	Central Storage			
QA Charts	5 Years	Central Storage			
SOPs-All Revisions	5 Years	Central Storage			
Accounting					
Payroll	5 Years	Accounting Storage	7 Years	Floppy Disk	Accounting Department
Checks, Receipts	5 Years	Accounting Storage	7 Years	Floppy Disk	Accounting Department
Invoices	5 Years	Accounting Storage	7 Years	Floppy Disk	Accounting Department
Ledgers	5 Years	Accounting Storage	7 Years	Floppy Disk	Accounting Department
Human Resources					
Personnel Files	7 Years	Human Resources			
Building Key/Security code Log	7 Years	Human Resources			

References

The following references were used in preparation of this document and as the basis of the STL San Francisco Quality System:

California Code of Regulations, Title 22, Div. 4, Article 8, “Quality Assurance Documents”, Section 64815.

Code of Federal Regulations, "Test Procedures for Analysis of Organic Pollutants", 40 CFR Section 136, Appendix A, B, C, July 1996 edition: Organics in water EPA Methods 608, 624, 625, and 200.7.

EPA Guidance for the Preparation of Standard Operating Procedures (SOPs) for Quality Related Documents, US EPA, Office of Research and Development, EPA QA/G-6, November 1995.

EPA Quality Manual for Environmental Programs, 5360, US EPA Office of Research and Development, National Center for Environmental Research and Quality Assurance, Quality Assurance Division, July 1998.

EPA Requirements For Quality Management Plans, EPA QA/R-2, US EPA Management Staff, Washington, DC, Draft Interim Final, August 1994.

EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, US EPA Quality Staff, Washington, DC, Interim Final, November 1999.

Federal Register, June 29, 1990, 40 CFR Part 261, Appendix II: TCLP. Instruction and operating manuals of various instrument manufacturers.

Good Automated Laboratory Practices, EPA 2185, 1995.

Handbook for Analytical Quality Control in Water and Wastewater Laboratories, EPA-600/4-79-019, USEPA EMSL, Cincinnati, OH, March, 1979: Laboratory QA/QC practices.

Leaking Underground Fuel Tank (LUFT) Manual, State of California Water Resources Control Board, August, 1990: Organics, TPH by gas chromatography, and toxics in soil and groundwater.

Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water, USEPA EMSL, Cincinnati, OH, September, 1986: Organics in water (drinking water).

Methods of Chemical Analysis of Water and Waste, EPA - 600/4-79-020, USEPA EMSL, Cincinnati, OH, Revised, March 1983, including Method 300.0, EPA-600/4-84-017, March 1984: Metals in water, inorganic parameters, oil and grease, and petroleum hydrocarbons.

Navy Installation Restoration Laboratory Quality Assurance Guide, Interim Guidance Document, Naval Facilities Engineering Service Center, February 1996.

Navy Installation Restoration Chemical Data Quality Manual, Navy IR CDQM, June 1998.

Shell for Analytical Chemistry Requirements, US Army Corps of Engineers, December 1998.

STL Quality Management Plan, M-Q-001, Revision 4, January 24, 2001.

Standard Methods for Examination of Water and Wastewater, 18th edition, American Public Health Association, 1992: Pesticides, wet chemistry, and petroleum hydrocarbons in waters, soils, and sludges.

Test Methods for Evaluating Solid Waste, SW-846, 3rd edition, USEPA OSW, Washington, D.C., November, 1986, including Update III, December 1996: Metals and organics in soils and mobility extracts; metals and organics in groundwater for RCRA compliance; hazardous material characterization.

Test Methods for Evaluating Solid Waste, “Quality Control”, SW-846, Chapter 1, Revision 1, July 1992.

Personnel

ERIC T. TAM

Education: **Bachelor of Science in Chemistry, May 1985**
University of California, Berkeley

Professional Experience:

11/87-present **Laboratory Director, STL San Francisco, Pleasanton, CA**
Responsible for overall management and direction of the laboratory operation. Includes hiring and managing chemists to carry out chemical analysis of environmental samples. Overseeing Chemists perform analysis using gas chromatographs, mass spectrometer, ICP, and other sophisticated techniques. Counsel chemists in developing methods used in the laboratory, trouble-shooting and maintaining instrument and preparing final reports to clients. Together with the Quality Assurance Department, responsible for obtaining and maintaining laboratory certifications and approvals.

11/85-11/87 **Senior Chemist, Anresco, Inc., San Francisco, CA**
Responsible for the day-to-day operation of the gas chromatography section of the laboratory. Duties include carrying out chemical analysis of environmental samples and food products using gas chromatograph and other instruments, supervising, developing new procedures to fit the needs of clients, etc.

8/85-11/85 **Chemist I, Anatec Laboratory, Santa Rosa, CA**
Responsible for carrying out routine wet chemistry procedures for environmental samples, analyzing soil gas samples using gas chromatograph, preparing and testing gas bombs, analyzing air samples for radon, running bacterial studies of water samples, etc.

DENNIS MAYUGBA

Education: **B.A. Biology, University of the Pacific, Stockton, CA**
Two year graduate course work in Biology, U.O.P.

Professional Experience:

6/95-present **Quality Assurance Manager, STL San Francisco, Pleasanton, CA**
Design and manage the implementation and maintenance of the laboratory's Quality Assurance Program. Semivolatiles GC and HPLC chemist II.

8/91-4/95 **Quality Assurance/Semivolatiles Chemist, Roy F. Weston, Inc.**
QA/QC practices includes data review and validation of organic and inorganic analysis: AFCEE; USACE; NEESA and CLP. Employee orientation and training, coordination of Performance Evaluation Studies, State Certification requirements, internal auditing of lab units, corrective action implementation, preparation of annual QA/QC reports, SOP generation and implementation and document control. GC operation and maintenance using FID and ECD detectors, HPLC operation and maintenance.

6/85-6/91 **Adjunct Instructor, University of the Pacific, Stockton, CA**
Designed and instructed Science Programs for Life Long Learning.

8/81-4/85 **Laboratory QA Technician, Diamond Walnut Growers, Stockton, CA**
Responsibilities included microbiological techniques and Wet chemistry analysis.

JILL THOMAS

Education: **B.A. Honors Chemistry, Mills College**
Minor Mathematics

Professional Experience:

11/92-present **Quality Assurance, STL San Francisco, Pleasanton, CA**
Responsible for the control and review of documents, preparation of the QA Manual, coordination of SOP's with Team Leaders. Assist in developing and maintaining laboratory Information Management System. Train and counsel chemists and technicians in techniques necessary to provide quality test results. Together with the QA Manager, obtain and maintain laboratory certifications and approvals.

5/90-11/92 **QA/QC Manager, GTEL Environmental Lab, Concord, CA**
Developed and operated quality assurance program. Trained chemists and technicians in proper analytical technique. Overall responsibility for GTEL's report production and quality. Responsible for obtaining and maintaining certification in thirteen states.

5/89-5/90 **Chemist, GTEL Environmental Lab, Concord, CA**
Performed all inorganic analysis. Trained and supervised chemists in inorganic analysis section.

10/86-5/89 **Chemist, Kennedy-Jenks Labs, San Francisco, CA**
Performed all gas chromatography analysis using EPA methods. Trained and supervised chemists in organics analysis section. Provided QA support for the laboratory.

GARY COOK

Education: **B.A. Chemistry, Dartmouth College, 1971**
M.A. Chemistry, University of Oregon, 1974
M.B.A. Marketing, Cal State University, Hayward, 1981

Professional Experience:

1990-Present **Director, Business Dev., STL San Francisco, Pleasanton, CA**
Responsible for customer accounts, customer satisfaction and the development of ChromaLab's business. Act as Project Manager for accounts.

1988-1990 **Technical Services Manager, Nuclepore Corp, Pleasanton, CA**
Provide technical support for customers, lead customer service department and developed business for specialty filter lines.

1982-1988 **Technical Manager, McKesson Chem. & Water Division, CA**
Lead technical support and research programs to two divisions of McKesson Corp.. Managed technical programs of $2MM/yr., operation programs of $5MM/yr. and capital programs of $1MM/yr..

1978-1982 **Laboratory Manager, Analytical Services, McKesson Corp., Dublin, CA**
Lead analytical service group providing support to $6 billion company, including environmental, product and process analysis. Also provided contract analysis worth $600,000 per year.

1974-1978 **Analytical Chemist, Formost-McKesson and Shaklee, CA**
Provided chemical analysis to support company operation and contract analysis for clients needing environmental and other testing.

AFSANEH SALIMPOUR

Education: B.S. Environmental Health

Professional Experience:

1998-Present **Project Manager, STL San Francisco, Pleasanton, CA**
Responsible for customer accounts, customer satisfaction and the development of ChromaLab's business.

1992-1998 **Project Manager/Marketing, Superior Precision Analytical**
Served as an interface between client and laboratory. Assisted clients with result interpretation. Advised chemists regarding data delivery requirements for their projects. Reviewed data packages and certifies analysis for accuracy. Provided sales staff with technical support.

1989-1992 **Senior Chemist, Superior Precision Analytical**
Responsible for managing the organic section of the environmental laboratory. Duties included; sampling management, tracking from sample log-in through reporting of results and utilizing computer based systems. Performed Gas Chromatography analysis of both soil and water in accordance with SWA methods. Performed maintenance and trouble shooting of analytical instrumentation including instrument set up. Interpreted reduction and data validation of chromatographs. Interacted and followed up with clients to alleviate and resolve potential problems. Supervised and trained new chemists.

1985-1989 **Chemist, Engineering Science, Inc.**
Duties included utilizing gas chromatography in determining presence of PCB, pesticides, aromatic and halogenated hydrocarbon in environmental water and soil samples. GC maintenance and trouble shooting, data entry and analysis using personal computers.

SURINDER SIDHU

Education: M.S. Botany Major, Biochemistry Minor
B.S. Chemistry

Professional Experience:

1995-Present **Project Manager, STL San Francisco, Pleasanton, CA**
Responsible for customer accounts, customer satisfaction, and the development of ChromaLab's business.

1991-1995 **Organic Lab Supervisor, Precision Analytical Laboratory**
Analysis for Volatiles and Semi-volatiles by GC/MS.
Supervised laboratory staff, result interpretation and trouble shooting in GC and GC/MS. Helped clients with technical questions on all analysis. Trained all new chemists in the lab. Responsible for QA/QC for laboratory data and graphs.

1987-1991 **Senior Organic Chemist, Clayton Environmental Consultants**
Analyzed hazardous waste on routine basis using EPA method for volatile and semi-volatile by mass spectra. Method validation studies for EPA mass spectra and gas chromatography.

1985-1987 **Senior Chemist, International Technology Corporation**
Analyzed hazardous waste by gas chromatography using EPA methods 601 through 613. Involved at various steps of plant treatment trouble shooting processes, reaction mechanism, rate reaction and allied kinetics. Analyzed hazardous waste using classical wet chemistry methods. Metals by ICP and AA. Instrumental experience on gas chromatography, deonex anion separation UV and IR spectrophotometer.

VINCENT VANCIL

Education: Los Positas College, Livermore, CA

Professional Experience:

1999-Present **Project Manager, STL San Francisco, Pleasanton, CA**
Responsible for customer accounts, customer satisfaction and the development of ChromaLab's business.

1995-1999 **Analyst, STL San Francisco (formerly ChromaLab, Inc.), Pleasanton, CA**
Responsible for extracting, loading and data reduction for in the Gas/BTEX department. Maintained equipment and coordinated the workload in for Gas/BTEX making sure that the results were on time and accurate.
Trained and showed proficiency in analyzing PCB's and Pesticides.

DANIEL WOODHAMS

Education: California State University, Long Beach, CA

Professional Experience:

11/95-Present **<u>MIS Manager,</u> STL San Francisco, Pleasanton, CA**
Responsible for design, purchase, installation, training and maintenance of Novel network and Laboratory Information Management Systems; creation of custom data packages to meet individual client needs.

12/88-10/95 **<u>Corp. Manager of Information Systems,</u> Resna Industries**
Managed staff of four direct and ten indirect personnel. Responsible for design, purchase, installation, training and maintenance of Novell based LAN/WAN, VAX cluster based accounting systems and all network and plant security.

6/86-12/88 **<u>Owner,</u> Woodhams Computer Consultants**
Sales, software DBMS developer, post-sale training and maintenance. Serviced client base of 100 plus PC systems. Directed the design team of DBMS software development corporation. Clients included: Hubbell Corporation, Dublin computer Systems, BMW-North America and Space Control Systems.

ZOLTAN ILES

Education: **University of Zabrab, Faculty of Geodesy, Zagreb, Croatia, 1991**
Data Tech Institute, San Jose, CA

Professional Experience:

02/98-Present **LIMS Specialist, STL San Francisco, Pleasanton, CA**
Responsible for design, programming and maintenance of ChromaLab's Laboratory Information Management System (LIMS). Integrates laboratory instruments into LIMS for direct data downloading.

1993-1998 **IS Manager and Senior Programmer/Analyst, Superior Analytical Laboratory, Inc., Martinez, CA**
Designed, coded, tested and implemented a Laboratory Information Management System (LIMS). Designed and developed a data validation application and transfer protocol for several Gas Chromatograph methods.

1986-1993 **Programmer/Analyst, University of Zagreb, Faculty of Technology, Zagrebg, Croatia**
Performed data analysis and graphical presentation of data for ongoing water pollution monitoring projects for the United Nations pollution monitoring program. Responsible for the design and development of application for controlling small intel8085 based units utilizing PCs and data transfer by modem to a remote computer

Group Team Leaders

Linda Atienza

03/97-Present **Team Lead for Organic Extractions Department, STL San Francisco, Pleasanton, CA**

B.S. Chemistry, University of Santo Tomas, Manila, Phils.
Thirteen years experience in the environmental field.

John Labash

07/94-Present **Team Lead for Metals, Classic Chemistry, and Sample Control Departments, STL San Francisco, Pleasanton, CA**

B.S. Wildlife Biology and Environmental Chemistry, Juniata College, Huntingdon, PA
Seventeen years experience as supervisor and analytical chemist focused on metals. Experience in running ICP, GC, FAA and CVAAS. Experience also includes scheduling work flow, supervising and training chemists and technicians, implementing QA/QC procedures, maintaining and troubling shooting instruments.

Michael Lee

12/95-Present **Team Lead for Semi-volatile Department, STL San Francisco, Pleasanton, CA**

B.S. Chemistry, Glassborn State, Glassborn, NJ
Ten years of laboratory experience with IT Corporation and GTEL. Responsibilities included wet chemistry techniques and general supervision of activities for the GC/MS group. Responsibilities included maintenance, method modifications and trouble shooting in the Volatile and Semi-volatile labs.

Group Team Leaders (continued)

Alex Tam

07/89-Present **Team Lead for Volatile Department, STL San Francisco, Pleasanton, CA**

B.S. Chemistry, San Jose State University, San Jose, CA
Twelve years analytical experience with ChromaLab, Inc., including EPA methods 8015, 8020, 8080, 8240, 8260 and 8270.

Glossary

Acceptance Limits – Limits of acceptable performance based on statistical studies of EPA Performance Evaluation samples.

Accuracy – The degree of agreement between a measurement and true or expected value, or between the average of a number of measurements and the true or expected value.

Action Limit – A control limit on a control chart which, if exceeded, requires corrective action to ve taken. Action limits are usually placed at $\pm$3 standard deviations from the expected or mean value.

Analyte – A component measured in a chemical analysis.

Assignable Cause – An event believed to have caused a change in precision or accuracy in a measurement process.

Audit - A systematic evaluation to determine the conformance to specifications of an operational function or activity.

Batch - Environmental samples, which are prepared and/or analyzed together with the same process, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of a similar matrix, meeting the above mentioned criteria. Where no preparation method exists (example, volatile organics, water) the batch is defined as environmental samples that are analyzed together with the same process and personnel, using the same lots of reagents, not to exceed 20 environmental samples. An **analytical batch** is composed of prepared environmental samples, extracts, digestates or concentrates that are analyzed together as a group. An **analytical batch** can include prepared samples originating from various environmental matrices and can exceed 20 samples.

Blank – Organic or aqueous solution, free of analytes under analysis.

Blind Sample – A proficiency sample submitted for analysis which has known values to the person submitting the sample, but unknown to the analyst. For internal continued proficiency studies, a blind sample may be purchased from a vendor or prepared internally from a second source standard which contains the analyte(s) of interest for a particular analytical method.

Bias – A systemic error that may occur within a method or that may be caused by an irregularity of the measurement system.

Calibration – Comparison of a measurement standard or instrument with another standard or instrument to eliminate by adjustment any variation from the true value.

Calibration Check Sample – A standard, from a source other than that prepared for calibration, and at a concentration midway on the calibration curve.

Certification – A formal evaluation and acceptance of a laboratory with respect to its competence in performing specified analyses.

Chain-of-Custody (COC) – A legal document which identifies samples collected and traces their source, dates, times, relinquishing and receival history and defines all analytical parameters to be measured; an unbroken trail of accountability that ensures the physical security of samples, data and records.

Check Standard – A calibration standard used to evaluate the measurement process of an instrument.

Comparability – Ability to provide analytical data comparable to other agencies and to provide similar data within the same laboratory over a period of time.

Composite Sample – A sample composed of two or more portions, mixed together.

Compromised Sample - A sample received in a condition that jeopardizes the integrity of the results.

Confirmation - Verification of the presence of a component using an additional analytical technique. These may include second column confirmation, alternate wavelength, derivatization, mass spectral interpretation, alternative detectors, or additional cleanup procedures.

Continuing Calibration Blank (CCB) – Organic or aqueous solution, free of analytes under analysis, unprepared, but containing the same volumes and reagents as calibration standards. It is run after the CCV to check the null reading for the calibration curve. The first CCB of a run may be referred to as an Initial Calibration Blank (ICV).

Continuing Calibration Verification (CCV) – A standard, from the same source used to prepare the calibration standard, and at a concentration midway on the calibration curve. The CCV is run to check that the instrument remains calibrated.

Control Chart – A graph plotting time against sequences of measurement results and including control limits. Results are expected to fall within these control limits in order to be statistically in control.

Control Limit – The limits on a control chart which are set by laboratory method studies. Points falling between these limits are considered statistically in control. Two kinds of control limits are usually used: warning limits and action limits.

Control Sample – A sample of known composition that is measured along with test samples in order to evalutate the measurement process.

Corrective Action - Action taken to eliminate the causes of an existing non-conformance, defect or other undesirable situation in order to prevent recurrence.

Data Audit - A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality.

Demonstration of Capability (DOC) - Procedure to establish the ability to generate acceptable accuracy and precision.

Detection Limit – The minimum concentration an analyte can be detected with confidence.

Document Control - The act of ensuring that documents (electronic or hardcopy and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.

Double Blind Sample – A type of proficiency sample where the analyst is unaware that it is a test sample.

Equipment Blank - A portion of the final rinse water used after decontamination of field equipment; also referred to as Rinsate Blank and Equipment Rinsate.

Field Blank - A blank matrix brought to the field and exposed to field environmental conditions.

Holding Time - The maximum time that a sample may be held before preparation and/or analysis as promulgated by regulation or as specified in a test method.

Instrument Blank - A blank matrix that is the same as the processed sample matrix (i.e. extract, digestate, condensate) and introduced onto the instrument for analysis.

Internal Chain of Custody - An unbroken trail of accountability that ensures the physical security of samples, data and records. Internal Chain of Custody refers to additional documentation procedures implemented within the laboratory that includes special sample storage requirements, and documentation of all signatures and/or initials, dates, and times of personnel handling specific samples or sample aliquots.

Instrument Detection Limit (IDL) - The minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific instrument. The IDL is associated with the instrumental portion of a specific method only, and sample preparation steps are not considered in its derivation. The IDL is a statistical estimation at a specified confidence interval of the concentration at which the relative uncertainty is $\pm$100%. The IDL represents a range where qualitative detection occurs on a specific instrument. Quantitative results are not produced in this range.

Laboratory Control Sample (LCS) - A blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

Laboratory Control Sample Duplicate (LCSD) – A replicate LCS.

Laboratory Quality Manual (LQM) - A document stating the quality policy, quality system and quality practices of the laboratory. The LQM may include by reference other documentation relating to the laboratory's quality system.

Limit of Detection (LOD) - The minimum amount of a substance that an analytical process can reliably detect.

Matrix - The substrate of a test sample.

Matrix Duplicate (MD) - Duplicate aliquot of a sample processed and analyzed independently; under the same laboratory conditions; also referred to as Sample Duplicate; Laboratory Duplicate.

Matrix Spike (MS) – A sample that is prepared along with its batch, but is spiked with a known amount of analytes from a stock solution before extraction and analysis.

Matrix Spike Duplicate (MSD) – A replicate MS.

Method – A description of sequential measurement procedures.

Method Blank – Organic or aqueous solution, free of analytes under analysis, that is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

Method Detection Limit (MDL) - The minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific measurement system. The MDL is a statistical estimation at a specified confidence interval of the concentration at which the relative uncertainty is $\pm$100%. The MDL represents a range where qualitative detection occurs using a specific method. Quantitative results are not produced in this range.

Non-conformance - An indication, judgement, or state of not having met the requirements of the relevant specifications, contract, or regulation.

Outlier – A data point that is not representative of the data set. It falls outside the control limits.

Performance Audit – A proficiency evaluation of an analyst or laboratory by assessing the results of known test-sample results.

Performance Evaluation (PE) Samples – A sample, the composition of which is unknown to the analyst and which has known values to the person or agency submitting the sample, submitted for analysis to test whether the analyst/laboratory can produce analytical results within specified performance limits. Also referred to as Proficiency Test (PT) Sample.

Precision – Agreement of replicate results, such as sample duplicates or spike duplicates. Precision will be expressed as percent relative standard deviation (RSD) or relative percent difference (RPD).

Preservation - Refrigeration and/or reagents added at the time of sample collection to maintain the chemical, physical and/or biological integrity of the sample.

Procedure – A set of systematic instructions for using a method of measurement or sampling.

Proficiency Testing - Determination of the laboratory calibration or testing performance by means of inter-laboratory comparisons.

Proprietary - Belonging to a private person or company.

Quality Assurance – A system consisting of quality assessment and quality control with the purpose of providing the assurance that defined standards of quality are met.

Quality Assurance Project Plan (QAPP) - A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.

Quality Control (QC) - The overall system of technical activities, the purpose of which is to measure and control the quality of a product or service.

Quality Control Sample - A control sample, generated at the laboratory or in the field, or obtained from an independent source, used to monitor a specific element in the sampling and/or testing process.

Quality Management Plan (QMP) - A formal document describing the management policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an agency, organization or laboratory to ensure the quality of its product and the utility of the product to its users.

Quality System - A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA/QC.

Quantitation Limit (QL) - The minimum amount of a substance that can be quantitatively measured with a specified degree of confidence and within the accuracy and precision guidelines of a specific measurement system. The QL can be based on the MDL, and is generally calculated as 3-5 times the MDL, however, there are analytical techniques and methods where this relationship is not applicable. Also referred to as Practical Quantitation Level (PQL), Estimated Quantitation Level (EQL), Limit of Quantitation (LOQ).

Raw Data - Any original information from a measurement activity or study recorded in laboratory notebooks, worksheets, records, memoranda, notes, or exact copies thereof and that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic/optical media, including dictated observations, and recorded data from automated instruments. Reports specifying inclusion of “raw data” do not need all of the above included, but sufficient information to create the reported data.

Record Retention - The systematic collection, indexing and storing of documented information under secure conditions.

Reference Standard - A standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived.

Relative Standard Deviation – The coefficient of variation expressed as a percentage.

Replicate – Two or more identical samples or measurements.

Reporting Limit (RL) - The level to which data is reported for a specific test method and/or sample. The RL is generally related to the QL. The RL must be minimally at or above the MDL.

Representativeness – Ability to provide data which is representative of the sampled medium.

Selectivity - The capability of a measurement system to respond to a target substance or constituent.

Sensitivity - The difference in the amount or concentration of a substance that corresponds to the smallest difference in a response in a measurement system using a certain probability level.

Significant figure(s) – Figure(s) that remains to a number or decimal after the ciphers to the right or left are canceled.

Spike - A known amount of an analyte added to a blank, sample or sub-sample.

Standard – A solution or substance prepared by an analyst to establish a calibration curve or analytical response function of the instrument.

Standard Operating Procedure – A procedure developed for repetitive use when performing a specific measurement of sampling operation.

Storage Blank - A blank matrix stored with field samples of a similar matrix.

Subsample – A representative portion taken from a sample.

Surrogate – Organic compounds similar to compounds being analyzed. Used in GC and GC/MS analyses for spiking.

Systems Audit - A thorough, systematic, on-site, qualitative review of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system.

Test Method – A defined technical procedure for performing a test.

Traceability - The property of a result of a measurement that can be related to appropriate international or national standards through an unbroken chain of comparisons.

Trip Blank - A blank matrix placed in a sealed container at the laboratory that is shipped, held unopened in the field, and returned to the laboratory in the shipping container with the field samples.

Verification - Confirmation by examination and provision of evidence against specified requirements.

Warning Limits – A control limit on a control chart, usually ± 2 standard deviations from the expected or mean value. Action is required when results fall outside the warning limits too frequently. A single value outside a warning limit does not necessarily require action, but should alert one to a possible problem.

STANDARD OPERATING PROCEDURES INDEX NUMBERING SYSTEM

CHAPTER	TITLE	METHOD
1.00	**WRITING SOPS**	QA PLAN
2.00	**SAMPLE HANDLING**	
2.01	SAMPLE CONTROLLER	QA PLAN
2.02	SAMPLE RECEIPT & SAMPLE LOGIN PROCEDURES	QA PLAN
2.03	INTERNAL SAMPLE CUSTODY	QA PLAN
2.05	IMPORTED SOIL SAMPLES STERILIZATION PROCEDURE	QA PLAN
2.06	CHANGES IN CHAINS OF CUSTODY	QA PLAN
2.07	LABORATORY SAMPLE DISPOSAL PROCEDURE	QA PLAN
2.08	SAMPLE COOLER DECONTAMINATION	QA PLAN
2.09	SAMPLE COOLER TEMPERATURE MEASUREMENT	QA PLAN
2.10	FIELD SERVICES	QA PLAN
2.12	LABORATORY PROTOCOL FOR PROJECT COMMUNICATION	QA PLAN
2.13	SUBCONTRACTED ANALYSES	QA PLAN
3.00	**LAB PREPARATION OF STOCK STANDARD SOLUTIONS**	
3.01	REAGENT WATER	QA PLAN
3.02	CHEMICAL CODING	QA PLAN
3.03	LABORATORY PREPARATION OF STOCK STANDARD SOLUTIONS	QA PLAN
3.03.01	METALS STANDARDS & SOLUTION EXPIRATION POLICY	QA PLAN
3.03.02	ORGANICS STANDARDS & SOLUTION EXPIRATION POLICY	QA PLAN
4.00	**SAMPLE PREPARATION PROCEDURES**	
4.01	SEMI-VOLATILES EXT. PROCED.IN WATER	40 CFR, Pt 136, App A, 625
4.02	SEMI-VOLATILES EXT. PROCED.IN WATER	EPA 3510C
4.03	SEMI-VOLATILES EXT. PROCED. IN SOIL	EPA 3550B
4.04	DIESEL - WATER	EPA 3510C
4.05	DIESEL - SOIL	EPA 3550B
4.06	PCBS - WATER	EPA 3510C
4.07	PCBS - SOIL	EPA 3550B
4.08	PCBS - OIL	EPA 3580A
4.09	PCBS - WIPE	EPA 3550B
4.10	PESTICIDES - WATER	EPA 3510C/40 CFR, 608
4.11	PESTICIDES - SOIL	EPA 3550B
4.09.01	SOLUBLE METALS - WATER	EPA 3005A
4.09.02	STLC EXTRACT PREPARATION	EPA 3005A
4.14	TOTAL METALS IN WATER BY GFAA	EPA 3020A
4.11.01	TOTAL METALS - WATER & EXTRACTS	EPA 3010A
4.11.02	TOTAL METALS WATER-SAMPLE DIGESTION	40 CFR, Pt 136, 200.7
4.12	METALS IN SOIL-SAMPLED DIGESTION	EPA 3050B
4.13.01	METALS IN WIPES	EPA 3050B M
4.13.02	METALS IN PAINT CHIPS	EPA 3050B M
4.14	POLYNUCLEAR AROMATICS - WATER	EPA 3510C
4.15	POLYNUCLEAR AROMATICS - SOIL	EPA 3550B
4.16	NITROAROMATICS & NITROAMINES BY HPLC- AQUEOUS SAMPLE PREPARATION	EPA 8330

STANDARD OPERATING PROCEDURES INDEX NUMBERING SYSTEM

CHAPTER	TITLE	METHOD
4.17	NITROAROMATICS & NITROAMINES BY HPLC- SOIL SAMPLE PREPARATION	EPA 8330
4.18	SUBSAMPLING	QA PLAN
4.19	P&T EXTRACTION FOR VOLATILE ORGANICS IN SOIL	EPA 5035
5.00	**EXTRACTION AND GENERAL CHEMISTRY PROCEDURES**	
5.01	**ALKALINITY**	**EPA 310.1**
5.02	ANIONS BY IC	EPA 300.0
5.03	TRPH - WATER	EPA1664
5.04	TRPH - WATER WITH CLEANUP	EPA 1664
5.04.01	TRPH - SOIL	EPA 1664
5.04.02	TRPH - SOIL WITH CLEANUP	EPA 1664
5.05	RCI	CAL TITLE 22
5.06.01	CONDUCTIVITY	EPA 9050A
5.06.02	CONDUCTIVITY	EPA 120.1
5.07	STLC/WET	CAL TITLE 22
5.08	TCLP EXTRACTION	EPA 1311
5.09.02	SILICA GEL CLEANUP FOR TEPH	EPA 3630C Modified
5.09.03	SULFUR CLEANUP FOR PCBS	EPA 3660B
5.09.04	SULFURIC ACID CLEANUP	EPA 3665A
5.10	DRY WEIGHT DETERMINATION	EPA SW846,CH 7
5.12	PAINT FILTERS LIQUID TEST	EPA 9095A
5.13	pH - WATER	EPA 9040B
5.14	pH - SOIL	EPA 9045C
5.15	IGNITABILITY	EPA 1010
5.16	TOTAL DISSOLVED SOLIDS	EPA 160.1
5.17	TOTAL SUSPENDED SOLIDS	EPA 160.2
5.18	SETTLEABLE SOLIDS	EPA 160.5
5.19	MULTIPLE EXTRACTION PROCEDURE	EPA 1320M
5.20	SYNTHETIC PRECIPITATION LEACHING PROCEDURE	EPA 1312
6.00	**VOLATILE ORGANICS ANALYTICAL PROCEDURES**	
6.01	GASOLINE & PURGEABLE AROMATICS-SOIL	EPA 5030B/5035/8015M/8021B
6.02	GASOLINE & PUR. AROMATICS-WATER & AIR	EPA 5030B/8015M/8021B
6.03	PURGEABLE CHLORINATED HYDROCARBONS	EPA 8021B
6.04	VOLATILE ORGANICS	40 CFR, Pt 136, App A, 624
6.06	VOLATILE ORGANICS	EPA 8260B
7.00	**EXTRACTABLE ORGANICS ANALYTICAL PROCEDURES**	
7.01	DIESEL & EXTRACTABLE HYDROCARBONS	EPA 8015 M
7.02	ORGANOCHLORINE PESTICIDES & PCBS	40 CFR, Pt 136, App A, 608
7.03	ORGANOCHLORINE PESTICIDES	EPA 8081A
7.04	PCBs	EPA 8082
7.05	SEMI-VOLATILE ORGANICS	40 CFR, Pt 136, App A, 625
7.06	SEMI-VOLATILE ORGANICS	EPA 8270C
7.05-O	POLYNUCLEAR AROMATIC HYDROCARBONS	EPA 8310
7.06-O	NITROAROMATICS & NITROAMINES	EPA 8330
7.07	ALCOHOLS & GLYCOL	EPA 8015A mod

STANDARD OPERATING PROCEDURES INDEX NUMBERING SYSTEM

CHAPTER	TITLE	METHOD
8.00	**METALS ANALYTICAL PROCEDURES**	
8.01	MERCURY - LIQUID	EPA 7470A
8.02	MERCURY - SOLIDS	EPA 7471A
8.03	NIOSH 7300-AIR	NIOSH 7082
8.04	HEXAVALENT CHROMIUM	EPA 7196A
8.05	METALS BY ICP	40 CFR 136, APP.C
8.06	METALS BY ICP	EPA 6010B
8.07	TOTAL METALS BY GFAA	EPA 7000
8.08	TOTAL METALS BY GFAA	SM 3113B
9.00	**AIR ANALYTICAL PROCEDURES**	CARB 410,NIOSH 7300, EPA 8260,8010,8020
10.00	**INSTRUMENT CALIBRATION & OPERATING PROCEDURES**	
10.01	OPERATION OF OPTIMA 3000XL	PE OPERATING MANUAL
10.02	MERCURY ANALYZER	PE OPERATING MANUAL
10.03	AAS PE5100	PE OPERATING MANUAL
11.00	**DATA HANDLING AND VALIDATION**	
11.01	DATA CHECK	QA PLAN
11.02	INORGANIC DATA REVIEW	QA PLAN
11.03	ORGANIC DATA REVIEW & ARCHIVAL PROCEDURES	QA PLAN
12.00	**QA PROCEDURES**	
12.01	CORRECTIVE ACTION	QA PLAN
12.02.01	1 STATISTICAL CONTROL LIMITS	EPA SW846,CH4
12.02.02	2 CONTROL CHARTS	EPA SW846,CH4
12.03.01	MDLS	EPA SW846
12.03.02	IDLS	EPA SW846
12.03.03	PRECISION/ACCURACY STUDIES	EPA SW846
12.03.04	MDL/IDL/RL TRACKING & IMPLEMENTATION	EPA SW846
12.04	PERFORMING MANUAL INTEGRATIONS	QA PLAN
12.05	PERFORMING TIME AND DATE CHANGES ON INSTRUMENTATION	CHROMALAB POLICY
12.06	CONTROL SAMPLE NOMENCLATURE	QA MANUAL
12.07	VALIDATION OF INITIAL & CONTINUING CALIBRATION DATA	EPA SW846
12.08	CRITERIA FOR METHOD BLANK ACCEPTANCE	EPA, SW846
12.09	INTERNAL CUSTODY OF EXTRACTS & DIGESTATES	QA MANUAL
12.10	NON-CONFORMANCE CONTROL	QA MANUAL
12.11	INTERNAL AUDITS	QA MANUAL
12.12.01	PERFORMANCE SAMPLES,ANALYSIS OF	QA MANUAL
12.12.02	INITIAL AND CONTINUED PROFICIENCY TRNG'	QA MANUAL
12.13	DOCUMENT CONTROL	QA MANUAL
12.14	SURVEILLANCES	QA MANUAL
12.15	RETENTION TIME WINDOWS	EPA 8000B
12.16	SELECTION OF CALIBRATION POINTS	QA PLAN
13.00	**GENERAL PROCEDURES**	

STANDARD OPERATING PROCEDURES INDEX NUMBERING SYSTEM

CHAPTER	TITLE	METHOD
13.01	REFRIGERATOR BLANK DOCUMENTATION	QA MANUAL
13.02	TEMPERATURE BLANK	QA MANUAL
13.03	GLASSWARE CLEANING	QA MANUAL
13.04	SAMPLE CONTAINER DOCUMENTATION	QA MANUAL
13.05	CALIBRATION OF BALANCES	QA MANUAL
13.06	REFRIGERATOR TEMPERATURE DOCUMENTATION	QA MANUAL
13.07	CRITERIA FOR DILUTIONS	CHROMALAB POLICY
13.08.01	PIPETTE CALIBRATION	CHROMALAB POLICY
13.08.02	PIPETTE USE	CHROMALAB POLICY
13.09	OPERATION OF DIGITAL THERMOMETER	IR OPERATING MANUAL
13.10	INSTRUCTIONS FOR CALIBRATING LABORATORY THEMOMETERS	QA MANUAL
14.00	**INSTRUMENT MAINTENANCE**	
14.01	PREVENTATIVE MAINTENANCE	QA MANUAL
14.02	MAINTENANCE LOG	QA MANUAL
15.00	**INFORMATION SYSTEMS**	
16.00	**REPORTING**	
17.00	**TRAINING**	QA MANUAL
18.00	**SAFETY**	H&S MAN'L,OSHA/NEPA

APPENDIX C
ADMINISTRATIVE RECORD

ADMINISTRATIVE RECORD

Agency for Toxic Substances and Disease Registry (ATSDR). .Toxicological profile for 1,3-Dichloropropene. U.S Department of Health and Human Services. February 1991.

American Association of Cost Engineers (AACE), 1993, Recommended Practices and Standards.

Bay Area Air Quality Management District (BAAQMD). 1996. "Meteorological Monitoring Guidance." *Manual of Procedures*. Volume IV. Appendix A. May.

California Code of Regulations, Title 22, Division 4.5 Environmental Health Standards for the Management of Hazardous Waste

California Code of Regulations, Title 8, Section 1532.1

California Environmental Quality Act (CEQA), Public Resources Code, Division 13, Section 21000, et seq

California Hazardous Waste Control Law, California Health and Safety Code, Division 20, Chapters 6.5 and 6.8.

California Occupational Health and Safety Act, Labor Code, Division 5, Section 6300, et. seq

California Environmental Protection Agency – Department of Toxics Substances Control (DTSC), Interim Guidance for Sampling Agricultural Soils for School Sites (Second Revision), August 26, 2002.

DTSC, Public Participation Policy and Guidance Manual EO-94-002-PP.

DTSC, Remedial Action Plan (RAP) Policy, EO-95-007-PP, December 5, 1995

DTSC, Removal Action Work Plans (RAWP), Memorandum, Barbara Coler, Statewide Cleanup Operations Division, March 14, 1995.

DTSC, Transportation Plan Preparation Guidance for Site Remediation, May 1994

DTSC, Voluntary Cleanup Agreement, California Department of General Services. Department of Toxic Substances Control, May 2003.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986

ENVIRON International Corporation. Phase II - Site Characterization Report University of California Former Bay Area Research and Extension Center (BAREC), 90 North Winchester Boulevard, Santa Clara, California. October 2003.

Jenkins, Sanders & Associates. Background Metal Concentrations in the San Francisco Bay Sediments. 1994.

Lawrence Berkeley National Laboratory. Analysis of Background Distributions of Metals in Soil at Lawrence Berkeley National Laboratory. June 2002.

IT Corporation. Final Removal Action Work Plan. Town and Country Village Shopping Center / Winchester Parcel. San Jose, California. November 1999.

Porter-Cologne Water Quality Control Act

Scott, Christina. *Background Metal Concentrations in Soils in Northern Santa Clara County California*. University of San Francisco, Masters Thesis 1991

U.S. Code of Federal Regulations, Title 40, Protection of the Environment, Part 300 National Contingency Plan

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U.S. Environmental Protection Agency, *USEPA Region 9 Preliminary Remediation Goals (PRGs).* October 1, 2002.

U.S. Environmental Protection Agency. 2000. *Meteorological Monitoring Guidance for Regulatory Modeling Applications.* EPA-454/R-99-005. February.

U.S. Environmental Protection Agency, *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA*, EPA/540-R-93-057, 1993.

U.S. Environmental Protection Agency, *Remediation Technologies Screening Matrix and Reference Guide*. EPA 542-B-93-005, 1993.

U.S. Environmental Protection Agency. 1992. *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised.* EPA-454/R-92-019. October.

U.S. Environmental Protection Agency, *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002*, December, 1989.

U.S. Environmental Protection Agency. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, October, 1988.

U.S. Environmental Protection Agency, EPA Test Methods for Evaluating Solid Waste-Physical/Chemical Methods, SW-846.

APPENDIX D

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) NOTICE OF DETERMINATION

NOTICE OF DETERMINATION

To: Office of Planning and Research
State Clearinghouse
P.O. Box 3044, 1400 Tenth Street, Room 212
Sacramento, CA 95812-3044

From: Department of Toxic Substances Control
Northern California – Coastal Cleanup Branch
700 Heinz Avenue, Suite 200
Berkeley, CA 94710

Subject: FILING OF NOTICE OF DETERMINATION IN COMPLIANCE WITH SECTION 21108 OR 21152 OF THE PUBLIC RESOURCES CODE

Project Title: Removal Action Workplan for the former BAREC site (now Santa Clara Gardens Development Project)

State Clearinghouse No.: SCH# 2003072093

Project Location: 90 North Winchester Blvd., Santa Clara, CA

County: Santa Clara County

Project Description: The Removal Action Workplan (RAW) consists of a removal and off-site disposal of soil contaminated with arsenic and dieldrin to an approved offsite facility. Approximately 6,000 cubic yards of soil will be excavated from an area that is a little over an acre in size. Most excavation will go down to three feet. Excavated areas will be backfilled with clean soil. The RAW was prepared consistent with the Health and Safety Code, Section 25356.1.

As ☐ Lead Agency ☒ a Responsible Agency under the California Environmental Quality Act (CEQA), DTSC approved the above-described project on **[date]** and has made the following determinations:

1. The project ☐ will ☒ will not have a significant effect on the environment.
2. A ☐ Negative Declaration ☐ Mitigated Negative Declaration ☒ Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures ☒ were ☐ were not made a condition of project approval.
4. A mitigation reporting or monitoring plan ☒ was ☐ was not adopted for this project.
5. A Statement of Overriding Considerations ☐ was ☒ was not adopted for this project.
6. Findings ☒ were ☐ were not made pursuant to the provisions of CEQA.

This is to certify that the final environmental document, comments and responses, and the record of project approval are available to the public at the following location: [Address] [City], CA [Zip Code].

Virginia Lasky	Hazardous Substances Engineer	510-540-3829
Contact Person Name	Contact Person Title	Phone #
Barbara J Cook		10/19/2007
Branch Chief Signature		Date
Barbara J. Cook, P.E.	Hazardous Substances Engineer Sup. II	510-540-3843
Branch Chief Name	Branch Chief Title	Phone #

TO BE COMPLETED BY OPR ONLY

Date Received For Filing and Posting at OPR:

CALIFORNIA ENVIRONEMNTAL QUALITY ACT
RESPONSIBLE AGENCY
STATEMENT OF FINDINGS

Project Title: Removal Action Workplan for the former BAREC (now Santa Clara Gardens Development Project)

State Clearinghouse Number: SCH 2003072093

Responsible Agency Contact Person: Virginia Lasky, Project Manager

Telephone No.: (510) 540-3829

Project Location: 90 North Winchester Blvd., Santa Clara, Santa Clara County.

Project Description: The Removal Action Workplan (RAW) consists of a removal and off-site disposal of soil contaminated with arsenic and dieldrin to an approved offsite facility. Approximately 6,000 cubic yards of soil will be excavated from an area that is a little over an acre in size. Most excavation will go down to three feet. Excavated areas will be backfilled with clean soil. The RAW was prepared consistent with the Health and Safety Code, Section 25356.1.

Findings:

As a Responsible Agency, DTSC reviewed the following documents prepared by the City of Santa Clara as Lead Agency for the larger redevelopment project to assess impacts as they relate to the project now before DTSC for consideration:

- City of Santa Clara, *Draft Environmental Impact Report (EIR) for the Santa Clara Gardens Development Project.* March 9, 2006 (SCH# 2003072093).
- City of Santa Clara, *Recirculated Draft EIR for the Santa Clara Gardens Development Project.* July 21, 2006.
- City of Santa Clara, Final EIR for the *Santa Clara Gardens Development Project.* March 26, 2007.

Using its independent judgment, DTSC makes the following findings:

1. The above documents a) adequately addressed the proposed impacts of the project now before DTSC for decision; and b) are adequate for use by DTSC for assessing potential impacts of the soil excavation, now before DTSC for approval.

   DTSC concurs with the findings made by the City in the above documents relating to the larger Santa Clara Gardens Development Project. In assessing impacts associated with the development project, the City concluded that approval of the overall development project would have significant unavoidable impacts to Land Use, Transportation and Circulation, and Cumulative Impacts on Air Quality, Transportation and Circulation, and Land Use and Agricultural Resources. As a result, the City adopted a Statement of Overriding Considerations. It should be noted that most of the significant and unavoidable impacts are associated with the larger project which is the development. However, in considering the impacts of the RAW, DTSC concluded the following:

   Land Use: The City finds the conversion of Farmland to Non-Agricultural Use to be a significant impact. There are no feasible mitigation measures available to reduce the project's important farmland impacts. Therefore, this would be a significant and unavoidable impact of the project. However, the DTSC project does not involve any land use decisions and therefore has no impact on agricultural resources.

   Transportation and Circulation: The EIR also found that future development may cause a potentially significant impact on vehicular site access and onsite circulation depending on the design/redesign and approval of project access roadways. This would, however, be mitigated by the following: by adding the project driveway to the existing signalized intersection and restricting the intersection of the west leg of Forest Avenue with Winchester Boulevard to right turns only. Because construction of this improvement requires a permit from the City of San Jose and the City of Santa Clara cannot guarantee that the mitigation measures will be constructed to accommodate project impacts on Winchester Blvd. This would result in significant, unavoidable short-term traffic impacts. However, the DTSC soil remediation project would generate up to 40 one-way truck trips per day. The remediation and development construction trips would not occur simultaneously since all remediation activities would be completed before project construction and would be using existing roadways. The remediation related trips would be temporary and would not substantially increase existing roadway traffic volumes. This would be a less-than-significant impact.

Cumulative Impacts:

a) Air Quality: EIR has determined that the development project could result in construction-related PM_{10} emissions that would contribute to the continued exceedance of BAAQMD thresholds. This is considered a significant cumulative PM_{10} air quality impact. However, the EIR acknowledged that remediation activities would not contribute to this cumulative impact due to the implementation of dust control measures incorporated into the RAW during remediation activities and the short duration of remediation activities. This would be a less-than-significant impact.

b) Transportation and Circulation: The development project would impact four intersections. Infrastructure improvements have been identified which would reduce these impacts to less than significant levels. However, due to the uncertainty of funding for the improvements, this remains a cumulatively significant and unavoidable impact. For remediation project, due to the limited number of trucks required for the implementation of the DTSC RAW, and it's temporary, short term duration, the DTSC RAW does not contribute to this significant unavoidable impact to Transportation and Circulation. This would be a less-than-significant impact.

c) Land Use and Agricultural Resources: The EIR determined that the conversion of agricultural land by the proposed development would result in a significant and unavoidable cumulative impact. However, the DTSC remediation of contaminated soil would not result in loss of agricultural land and does not involve any land use decisions. This would be a less-than-significant impact.

2. Approval of the RAW will not result in significant effects on the environment. Mitigation measures identified in the EIR for Noise and the Cultural Resources Impacts have been incorporated into the RAW, as appropriate, to reduce impacts to less-than-significant levels. No additional DTSC mitigation measures are necessary to approve the project; and no DTSC monitoring plan is required as otherwise required pursuant to Public Resources Code Section 21081.6.

A Notice of Determination (NOD) indicating the results of said findings will be filed with the State Clearinghouse of the Governor's Office of Planning and Research pursuant to Section 15096(I) of the State CEQA Guidelines.

Certification:

I hereby certify that the statements furnished above present the data and information used to support the findings made herein pursuant to Cal. Code Regs., tit. 14, § 15091 or 15096 (h), and the facts, statements, and in formation presented herein, are true and correct to the best of my knowledge and belief.

Barbara J Cook

DTSC Branch Chief Signature

10/19/2007

Date

Barbara J. Cook, P.E.

DTSC Branch Chief Name

Hazardous Substances Engineer Sup. II

DTSC Branch Chief Title

(510) 540-3843

Phone #

APPENDIX E

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY
FOR
THE DRAFT REMOVAL ACTION WORKPLAN
BAY AREA RESEARCH EXTENSION CENTER (BAREC)
90 NORTH WINCHESTER BLVD.,
SANTA CLARA, CALIFORNIA
October 2007

Between March 22 and April 21, 2006, the Department of Toxic Substances Control (DTSC) held a 30-day public comment period the draft Removal Action Workplan (RAW) for the Former Bay Area Research Extension Center (BAREC) site located at 90 North Winchester Blvd., Santa Clara, California. This document was placed in the information repositories listed below to provide the public with information regarding the proposed removal action and to solicit public comments on the adequacy of the document.

On March 21, 2006, DTSC mailed out a Fact Sheet, which summarized the draft RAW and proposed site cleanup methods, to the site mailing list. A Public Notice display advertisement for the draft RAW was placed in the San Jose Mercury News on March 22, 2006. Copies of the fact sheet and display advertisement are found in Attachment A. A public meeting was held on April 13, 2006 at which DTSC received oral comments.

The draft RAW provided the findings of the investigations, removal action objectives and removal alternatives evaluated to address pesticides (mainly, dieldrin) and arsenic contamination in soil at the site. The draft RAW proposed to excavate soil containing contaminants above cleanup levels for residential land use and dispose of it at an approved offsite facility. There will be no other restrictions.

DTSC received verbal and written comments during the public comment period. DTSC's responses to these comments are provided below. After review and consideration of the comments, DTSC approved and adopted the attached draft RAW as the Final RAW. A copy of the Final RAW and other site-related documents is available for review at the following locations:

Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, California 94710
(510) 540-3800
Monday thru Friday
Excluding State Holidays
8AM to 5PM

Central Park Library
2635 Homestead Road
Santa Clara, CA
(408) 615-2200
Mon. & Tues. (9AM – 9PM)
Wed. (12PM – 9PM)
Thurs. thru Sat (9AM – 6PM)
Sunday (1-5PM)

This Responsiveness Summary is organized as follows:

- Section I is the introduction.
- Section II lists the comments received and provides responses to those comments.
- Attachment A provides copies of the fact sheet and display advertisements.
- Attachment B provides a map showing the location of the BAREC Site.
- Attachment C includes a copy of the transcript for the public meeting held on April 13, 2006
- Attachment D includes copies of the written comments received.
- Attachment E includes copies of supporting documentation for the responses.

RESPONSE TO COMMENTS

This section provides responses to verbal comments received during the public comment period. Comments have been grouped by topic and either included verbatim or summarized. Comments containing similar content have been combined where a similar response is appropriate. The comments are followed by reference numbers that indicate which commenter(s) made the comment (each commenter has been assigned a reference number). A list of the reference numbers, commenters, and the media through which the comment was received is located on pages 21-22.

Dust /Particulates

Comment 1: The plan to clean up the contaminated soil is inadequate to protect the surrounding neighborhood from exposure to wind-borne dust containing arsenic and dieldrin. **(1, 2, 3, 8, 10, 14, 17)**

Response 1: The Removal Action Workplan (RAW) includes dust control measures that will minimize or suppress airborne dust. In addition real-time dust monitoring is required. If the difference between downwind and upwind particulate concentrations is found to be above 50 micrograms of particulate/cubic meter, additional dust control measures such as watering or work stoppage would occur.

This limit is protective of neighbors. Based on our calculation and using the maximum concentration of arsenic in soil at 37 mg/kg and the particulate limit of 50 micrograms (ug) of dust /cubic meter, the worst-case calculated airborne concentration of arsenic of 0.00185 ug/cubic meter does not exceed the Acute Recommended Exposure Level (REL) in air of 0.19 ug/cubic meter. This worst case estimate is approximately one hundred times lower than the Acute REL.

While there is no available Acute REL value for aldrin/dieldrin, the U.S. EPA Ambient Air Preliminary Remedial Goal (PRG) of 5.6×10^{-4} ug/cubic meter was used. The PRG is a level which US EPA has determined to be acceptable and is a conservative value because it is based on long term exposure. Based on our calculation and using the maximum concentration of dieldrin in soil at 240 ug/kg and the particulate limit of 50 micrograms of dust /cubic meter, the calculated airborne concentration of dieldrin of 1.2×10^{-5} ug/cubic meter does not exceed the USEPA Ambient Air PRG 4.2×10^{-4} ug/cubic meter This worst case estimate is based on the maximum concentration not the average and is approximately 40 times lower than the Ambient Air PRG.

Comment 2: What is the height and construction of the wind screen. **(3, 19)**

Response 2: A 10 foot high wood fence or an equivalent with bracing will be installed and will remain in place during cleanup of the site.

Comment 3: You are claiming that there is no contamination during transport, but what about surrounding urban area. **(3, 10)**

Response 3: Before leaving the site, truck tires will be cleaned and trucks will be covered.

Comment 4: The 50 ug/m^3 PM_{10} concentration threshold to implement dust controls strategies during the clean-up (Section 11.4 of the RAW) is probably insufficient to guarantee that PM_{10} levels downwind of the site are below the Recommended Action Level (RAL) for eight-hour average PM_{10} concentration of 87 ug/m^3 (Section 1.1.3). Particularly on days when the background concentration of PM_{10} is large a contribution of 50 ug/m^3 (or slightly below) from the soil clean-up could bring total PM_{10} contributions downwind of the site to levels higher than the eight-hour RAL. A lower threshold than 50 ug/m^3 should therefore be used during days of high background PM_{10} concentrations to ensure that the RAL is not exceeded during these periods. **(11)**

Response 4: Because the work will only occur between 7 A.M. and 6 P.M., applying a difference between downwind and upwind of 50 ug total particulate/cubic meter as based on an instantaneous reading, will ensure that the project do not cause exceedences of the PM_{10} standards. PM_{10} (Particles less than 10 micrometers in diameter) is a subset of total dust. By applying the limit proposed to total particulate, DTSC is able to ensure that changes to work practices can be made in a timely manner to ensure that the applicable standards, which are based on a 24-hour average, are not exceeded.

Comment 5: The siting of the PM_{10} measurement stations downwind of the clean-up site is extremely important for the success of the proposed mitigation strategy since measurements from these stations will be used to determine if soil clean-up is yielding PM10 concentrations greater than your chosen threshold (currently 50 ug/m^3). Particularly, it is important that these locations are located immediately downwind of the site to ensure that measurements are taken at the true location of maximum impact. No analysis was presented in the RAW, however, showing the proposed positions of these downwind sites relative to the prevailing wind direction of the area. Also, it was unclear in the RAW whether these stations would be mobile so that, if necessary, they could be repositioned in real-time downwind of the clean-up. If this clean-up strategy is carried out, please ensure that the PM_{10} measurement devices are sited according to such an analysis and in consultation with a qualified air pollution meteorologist. **(11, 24, 26)**

Response 5: The on-site meteorological station will be located in an area representative of wind patterns for the site, as described in published guidance. On-site meteorological data collected will include wind speed and direction, temperature, and relative humidity. During excavation and loading of contaminated soils, fence line monitoring and meteorological data will be collected on an hourly basis. Also there will be visual observations to ensure that visible dust is under control and minimized. If dust levels exceed a 50 ug/m^3 difference between upwind and downwind monitors, then additional dust control measures will be implemented. No specific PM_{10} monitoring will be conducted, only total particulate will be measured during excavation and loading activities.

Comment 6: Is there any reporting to the public once dust has been put into the air? **(15)**

Response 6: DTSC will post the daily air monitoring data on its website. The location of the information will be included in the work notice which will be sent out to the community prior to the start of clean up work.

Site Characterization

Comment 7: There is a lack of documentation regarding the chemicals used on the site. All records of chemicals and pesticides used on the facility since the 1920 should be located. **(3, 8, 7, 15, 16)**

Response 7: A review of pesticide records indicated that the records available were only available from 1979 to 2002. California regulations did not require records of pesticide use until 1980. Much of the information provided in the Site Characterization Report was based on discussions with University of California personnel. Based on the records available and the interviews, approximately 90 chemicals were used (Section 2.1, Site Characterization Report). The records indicate that many of these chemicals were used in very small quantities on the scale of what a typical homeowner might use in their backyard. 76 of these chemicals are of low toxicity given the nature of the chemical and the quantities used (see page 11-12 of the Site Characterization Report). The remaining 14 chemicals (Table 3, Site Characterization Report) were tested at approximately 60 locations throughout the site (Figure 3, Site Characterization Report). In addition, even though there were no records of use at the site, an additional 60 pesticides/herbicides known to be in use prior to 1979 and that could be potentially toxic and persistent in the environment (depending on the quantity and frequency of use) were also tested at approximately 60 locations across the site. In summary, 89 chemicals were tested at approximately 60 different locations across the site.

Comment 8: Why didn’t you do the minimum sampling of about 3-4 probes per acre on the site? **(3, 26)**

Response 8: Soil samples were collected from approximately 60 locations across the entire BAREC site. An additional 76 samples were collected to determine the extent of contamination. This work was performed in accordance with California Environmental Protection Agency – Department of Toxic Substances Control (DTSC) guidance for sampling agricultural sites for future schools (http://www.dtsc.ca.gov/PublicationsForms/prog_pubs.cfm?prog=Site%20Cleanup) Because of the additional sensitivity of children to potentially toxic substances, sampling and testing for potential school sites requires more samples and tests than sampling and testing for other land uses.

Comment 9: The three samples that had the most elevated concentrations of dieldrin are in Field 1 and Field 3. The three points are over ½ acre apart. That DTSC average the measurements so only one became a problem. More tests should be done. **(3, 5, 11, 19)**

Response 9: U.S. EPA recommends using the average concentration to represent "a reasonable estimate of the concentration likely to be contacted over time". The guidance previously issued by EPA in 1992, Supplemental Guidance to RAGS: Calculating the Concentration Term (EPA 1992), states that, "because of the uncertainty associated with estimating the true average concentration at a site, the 95 percent upper confidence limit (UCL) of the arithmetic mean should be used for this variable." (http://www.hanford.gov/dqo/training/ucl.pdf) The 95% upper confidence level (UCL) of the mean for dieldrin concentrations at the site was calculated and the result indicated it to be below the cleanup level. In spite of this, the highest concentration of dieldrin will be removed. Confirmation samples will be collected to ensure that cleanup goals will be met.

Comment 10: There were at least five fuel tanks on the site, two as large as 1,000 gallons. DTSC did not perform any significant testing other than the surface and did not discover any problems. **(3, 5)**

Response 10: There were 4 fuel tanks: two underground 1,000 gallon tanks and two above ground 500 gallon tanks. The Santa Clara Fire Department oversaw the tank removal work and made a determination that further work is not required. The 1,000 gallon tanks were observed to be in good condition with no evidence of leaks or damage when they were removed in 1993. Since the tanks were in good condition, contamination was not expected. Samples were collected from the soil beneath the tanks and the results showed that contamination was not present.

The other two tanks were above ground, portable, double walled tanks which were situated on a concrete pad. Sample results confirmed that contamination was not present near these tanks.

Comment 11: Soil sampling did not follow an approved protocol and was inadequate. The method and rationale for choosing 75 locations over 17 acres were not provided. You did not perform any deep soil testing or groundwater testing? Why? This development will affect all of that, including run-off, groundwater, the water table in general, etc. Why did you not do deeper soil test in areas that you know will be dug up deeply, like the foundations for the senior facility? The digging will go at least 35-40 feet (of not more) since there will be multiple 4+ story buildings. Why did you not test this far? **(3, 5, 8, 17, 22, 25)**

Response 11: Sampling procedures and protocol were described in section 2 of the Phase II - Site Characterization Report dated October 2003. Deeper samples for pesticides were analyzed whenever there was a detection above the Preliminary

Remediation Goals (PRGs) or background at the surface (0 to 6 inches) as in soil sampling locations F1-C, F3-A, F3-B, F3-E, F3-F and F7-G.

Dieldrin and arsenic were detected consistently only in shallow soil samples and at no deeper than 3 feet for dieldrin and 4 feet for arsenic. Arsenic and dieldrin bind to the soil and therefore do not move easily downward and are not expected to be present in the deeper soil or in groundwater. The data collected supports this. The depth to groundwater is between 20 and 30 feet deep. Based on the soil sample results, groundwater sampling was determined to be unnecessary.

Sampling locations were identified and samples were collected based on how the property was used based on the historical information available. The rationale for choosing the methods (or the contaminants) and the locations are described in sections 1 and 2 of the Site Characterization Report. Surface sample results, other than dieldrin and arsenic, were either less than the screening and detection levels, or within background levels.

Comment 12: What about soil testing in the neighbor's yards? You are doing a disservice to the neighbors by not testing everything in the area, that is, all the houses that border the property should have soil tests to make sure there is not chemical and pesticide pollutants in their back yard. This should be a mandate and requirement in your RAW. **(3, 7, 15)**

Response 12: Based on the sampling results at the edges of the property, there is no indication that the BAREC site has contaminated the adjacent properties. DTSC has been made aware of sample results from some of the adjacent properties which have elevated dieldrin. DTSC is working with those property owners to sample those backyards adjacent to the BAREC site.

Many areas in Santa Clara County were used for agricultural purposes. The use of pesticides/herbicides to control pests or weeds was a normal part of farming and the detection of pesticides/herbicides in land previously used for agriculture is not uncommon. DTSC does not have information that indicates that the BAREC site caused the contamination detected in the residential backyards.

Comment 13: The BAREC site was used for over 70 years to test agricultural pesticides. Nonetheless, laboratory analysis was conducted for only a handful of the 90 known pesticides applied to this site, and for none of the unknown pesticides applied for half a century before records were maintained. No empirical data in the form of broad spectrum analyses were developed to validate the decision not to test for other pesticides, nor were the theoretical calculations purportedly supporting this decision actually presented in the Phase II document. **(5)**

Response 13: In the 1900's, the active ingredients in most pesticides were arsenic, antimony, selenium, sulfur, thallium zinc, copper, or plant-derived alkaloids. Other simple inorganic compounds (e.g., sodium nitrate, ammonium sulfate and sulfuric acid) were put into very limited use after a few decades as herbicides. (California's First Century of Pesticide Regulation, California Department of Pesticide Regulation). The first commercially manufactured synthetic pesticides were the organochlorine pesticides (e.g., DDT, dieldrin, aldrin, etc.) which were produced beginning in 1943. The organochlorine pesticides (DDT, dieldrin, chlordane, etc.) are considered the most persistent and toxic of all the synthetic pesticides. After the ban of DDTs and other pesticides in the 1960s, non-persistent synthetic pesticides were manufactured such as: organophosphates, carbamates, pyrethroids, and biopesticides. These newer type of pesticides have much shorter half-lives and their concentrations and toxicity reduce quickly after application.

Given the history of pesticide use in California, the sampling conducted at the site focused on the most persistent and toxic pesticides (e.g., DDT, aldrin, dieldrin endrin, etc.).

Comment 14: The Phase II relied on out-of-date closure documents with limited testing to conclude that there are no risks from underground storage tanks, a pesticide evaporation basin, and a leach field. These closure documents were not intended to support unrestricted residential usage. **(5)**

Response 14: See Response 10 regarding the tank removals.

The sewer leach pit was sampled at 7 feet and 10 feet below ground surface for the presence of organochlorine pesticides. According to the Environ staff, consultant for DGS, the depth of the pit during the sampling was observed to be 7 feet. A 1977 drawing indicate however that the dimension of the pit was 4 feet wide by 6 feet long and a depth of 4 feet (Page 8 of the Site Characterization Report). Results were non detect. (Page 17 of the Site Characterization Report).

The evaporation basin (bed) had a liner which consisted of two sheets of 20-mil-thick nylon-reinforced butyl rubber liner which was found to be in good condition. Composited sediment samples were collected in July 1987. Results indicated detections of some pesticides. Additional sampling on the soil was conducted in October 1987, after removing the liners. Sample results indicated detection of chloropropham. There is no available health screening level for chloropropham but it is classified by U.S. EPA as slightly toxic. It has a half-life of 30 to 65 days in soil depending upon the temperature. Based on the half-life, it is estimated that the contaminant concentration present to be very low or gone. Additional soil samples were collected on the pond and the sediment trap for arsenic, the results indicate the concentrations are within the San Francisco Bay Area soil background concentrations. (Pages 6, 7 and 17 of the Site Characterization Report).

Comment 15: Who did the initial sampling of the site? **(12)**

Response 15: Sampling at the BAREC site was conducted by consultants hired by the Department of General Services.

Comment 16: What happens if the contamination is actually deeper than what we initially thought?**(12, 13, 22, 25)**

Response 16: Confirmation samples will be collected from the edges and the bottoms of the excavations to determine whether the cleanup goals have been met. If the confirmation samples find additional contamination, DTSC will instruct the contractor to excavate additional material.

Comment 17: During the late 1940's, 50's and 60's, it was a common practice to bury un-used chemicals and that there are numerous burial sites at BAREC, although there are no clear records. **(8)**

Response 17: Interviews with UC personnel and review of existing records including areal photos and site operations, did not reveal information regarding existence of buried unused chemicals. The sampling at the site targeted areas where chemicals were reportedly handled. No buried containers were found in any of the 60 plus locations where samples were collected.

Comment 18: The RAW does not address the existing onsite water supply well used historically for the agricultural testing activities. This well, which penetrates a deeper aquifer beneath the site, should be properly abandoned so that it does not serve as a potential migration of contaminants its vicinity. Groundwater samples should be collected from this well to characterize the deeper aquifer and further provide support to justification for its fate **(5, 8).**

Response 18: The well was abandoned in accordance with State and local requirements. A Well Destruction Completion Notice was issued (See appendix E) by The Santa Clara Valley Water District on July 7, 2004.

Comment 19: DTSC said it is not aware of any water issues or water runoff. At the intersection of Forest and Henry, where the fence is exposed and the dieldrin is at the highest concentration, is also the location where the water pools frequently. How could DTSC conduct its study and make a recommendation without doing a full examination of the site at all times? **(3, 16, 25)**

Response 19: Water and runoff issues were not observed during site visits and therefore not documented in the Draft RAW. Confirmation samples will be collected after the excavation to ensure that contamination has not spread.

Comment 20: It seems like with the high-rise senior center, with a four-story building the footings are going to be much deeper than two feet. Have they tested deeply, say for the foundation for a high-rise? **(8, 19, 22)**

Response 20: Deeper samples were only taken in areas where contamination was found in the shallow samples. About 35 samples were collected in the area where the senior housing is proposed and the results showed only two locations above the cleanup level and are located in the shallow soils which will be removed and properly disposed.

Comment 21: If the pesticides and other chemicals that are used are not healthful to humans, and they sprayed and there's evidence and we -- here we have up to 80 years' worth of them, we don't, we don't have a map in the, in the RAW report about where that water was going during water runoff? **(25)**

Response 21: Maps provided in the Draft RAW define the extent of contamination. For this property, other than the place where the dieldrin is high, all the samples near the edge of the property were below the screening levels. There was no sample collected between the fence and the elevated dieldrin detection, but the field where the pesticides were applied does not go all the way to the fence. Confirmation samples along the edge of the excavation nearest the fence will be taken to confirm that the dieldrin has not moved onto the adjacent property.

Risk Assessment

Comment 22: Although preparation of a Human Health Risk Assessment (HHRA) is typical for any removal action, this RAW is not based on an HHRA. Thus, cleanup levels are not based on an assessment of the actual risk to future residents from residual contamination. Instead, the cleanup levels are based only on meeting background arsenic levels and the EPA's PRG for dieldrin. Further, the arsenic background determination used for the cleanup level is not based on any credible source. Indeed, the background level assumption is contradicted by the very sampling data included in the Phase II report. **(5)**

Response 22: The process DTSC follows to characterize a site is to first review historical uses of the property, conduct site sampling to determine what is present and then compare it against screening values or known background levels. For this site, there were only two contaminants (arsenic and dieldrin) that were above the screening levels.

Because arsenic is widely present in background soil, a site or regional background number can be used as cleanup goal instead according to U.S. EPA guidelines (http://www.epa.gov/region09/waste/sfund/prg/index.html#prgtable) The arsenic background concentration is based on plotting the cumulative frequency of the shallow arsenic soil concentrations at the site which shows an inflection point at 20 mg/kg, indicating anything above 20 mg/kg are considered to be above background levels. The Town and County Village Shopping Center site was made a reference because its remedial action objectives used 12 mg/kg as a site wide average concentration and a maximum arsenic concentration of 20 mg/kg similar to BAREC as shown in Table 1. Based on the above information, the use of a screening level and background level instead of a human health risk assessment are considered appropriate approach for assessing the health hazard of the site.

Based on the results of the sampling conducted as part of the Site Characterization Study, DTSC determined that removal of arsenic above the naturally occurring background levels would be appropriate as a cleanup goal and that a stand alone Health Risk Assessment was not necessary.

DTSC has evaluated the cumulative health risk of all of the pesticides detected at the site by using the equation provided by the Office of Environmental Health Hazard Risk Assessment (OEHHA) at their website: http://www.oehha.ca.gov/risk/pdf/Hazard-Risk%20Calculator11-04.xls**.** The calculation indicates that the cumulative health risk is within the U.S. EPA target health risk range of 1 x 10^{-4} and 1 x 10^{-6}.

Using the 95^{th} upper confidence level of the mean for the pesticide data (arsenic is not included because background levels are above risk based screening levels), the excess cancer risk before cleanup is already less than 1 in a million. (If maximum concentrations are used the excess cancer risk is approximately 9 in one million, which is also within the acceptable risk range) Because the dieldrin in one sample is 8 times the screening level, the RAW requires the removal of this area. With the removal of this soil to the cleanup goal, the risk assessment calculation using the maximum would be 3 in one million. The outputs from these evaluations are located in Appendix E

A Screening-Level Risk Assessment was also conducted for the site which assesses potential cancer and health hazard (non-cancer) risks from the dust generated during the soil removal regarding. Results of the Assessment indicate the estimated risks for both cancer and non-cancer are below the acceptable level. The assumptions use for these calculations are very conservative.

Comment 23: An HHRA was prepared as part of a 2002 Phase II Report. DTSC never reviewed this analysis - despite the Department of General Service's obligation to submit this information pursuant to the Voluntary Cleanup Plan. **(5)**

Response 23: DTSC did not require the submittal of an HHRA. The 2002 HHRA referenced here was not reviewed by DTSC.

Also, the Voluntary Cleanup Agreement for the BAREC site includes DTSC's boilerplate language for the site cleanup process which includes a reference to a risk assessment. For this site, DTSC did not require the submittal of a Human Health Risk Assessment (HHRA) prior to development of the Draft Removal Action Workplan (Draft RAW), because cleanup was going to be to the screening levels and/or background level.

Cleanup Alternatives and Cleanup issues

Comment 24: Commentors opposed all the stated clean-up alternatives in the workplan (1).

Response 24. Comment noted.

Comment 25: Why weren't the non-excavation alternatives discussed or explored? An alternative remediation should be used such as phytoremediation. This method raises no contaminated dust. Plants can take in and store dieldrin from the soil. This is the safest method for a residential area. Also, has been found to have a 20 to 80 percent cost savings over the State's proposed methods. **(1, 2, 3, 5, 7, 11)**

Response 25: Non excavation techniques were considered informally as part of development of the Draft RAW. Phytoremediation is a promising technology, however, the fate of the contaminants is uncertain, and it can take years to decades to find out if remediation is successful. Specific species of plant and the right type of soil have to be used to increase the success of the phytoremediation. Other uncertainties include, change in season and whether the specific plant species would live long or needed to be replanted. In addition, arsenic contamination found at the site was as deep as 3 ½ feet below the surface. In order to ensure that the plant root systems have access to this material, it would have to be excavated and spread on the site. This would require tilling and grading. In addition, the contaminated plant materials would then need to be disposed of properly to ensure that the contamination is not spread to other areas of the property or other off site locations. The excavation and off-site disposal is a recognized technique. The length of time to implement is about 14 days. DTSC feels that removing contamination from the site is the most protective way of cleaning-up this site.

Comment 26: On page 4-54 of the Draft EIR, it speaks about the objective of the RAW: ". . . to minimize the exposure of future site residents. What about the current residents in the area? What about the current population you are sacrificing? **(3)**

Response 26: Implementation of the RAW protects both current residents and future residents from exposure to significant concentrations of contaminants at the BAREC site.

Comment 27: The safest and most conservative way to protect the human population is using techniques such as phytoremediation and bioremediation. These are non-invasive approaches and focuses on protecting human health and doing things organically to fix the problem, not just move it. You should not be pressured by timelines to do the right thing and not be pressured by financial concerns. We have assembled a number of experts and organizations that are willing to help clean this place up naturally and not remove soil, endangering the public and neighbors.

Because no matter what the development is, the soil should be cleaned properly and completely. Do you really think putting children and a high-density senior facility on a toxic dump is a good thing if the toxins are not cleaned up completely? Don't you want to leave this site free from all chemicals and pesticides and know you did the right thing?

If you were a resident in the neighborhood and had the chemicals in the soil in your area, what would you want done? **(3, 4, 5, 7, 8, 11, 19)**

Response 27: Phytoremediation and bioremediation are not completely "non-invasive" technologies. Phytoremediation would not be able to address the arsenic contamination at depth with out excavation and spreading of the soil. Bioremediation also relies on the biota and nutrients being mixed into the soil. This requires tilling of the soil as well. Removing contamination from the site is the most protective way of cleaning-up a site and can be done in a short time period, in a few weeks.

The goal of the cleanup is to remove the contaminants to unrestricted land use which is protective of people of all ages. While cleanup is occurring, dust control measures (discussed in response 1) will take place and DTSC will require real-time monitoring.

Comment 28: The draft RAW indicates that, "at no time, will the trucks travel through residential area." It is impossible since the contaminated soil is in the middle of a residential area. **(1, 3)**

Response 28: No truck traffic will occur on Forrest, North Henry or Dorcich within the residential neighborhood. Trucks will enter and exit the site on Winchester Boulevard and travel to Stevens Creek Boulevard then to either Interstate 280 or 880 to an appropriate landfill.

Comment 29: While you're digging you're planning to stock the soil someplace else and cover it at night, and then after you've dug whatever depth you're going, you're going to be putting in clean soil, correct, to cover that hole? **(20)**

Response 29: Stockpiling would occur so that they can load the trucks efficiently and they can excavate efficiently. The majority of the soil would be loaded directly into the trucks instead of stockpiled. Doing this will also minimize the potential for creation of dust.

As far as bringing in clean fill, DTSC is not requiring that the excavations be backfilled with clean soil so the contractor could grade the soil or, if they wish, bring in clean soil to ensure that the excavations are not safety hazards.   If any fill material is brought in, DTSC would make sure that it is meets the cleanup standards for the project.

Comment 30: I am concerned that if you're going to bring clean fill in, the traffic on Winchester Boulevard, the street's going to start cracking and everything with all that heavy materials. Will there be somebody out there like traffic control, because those trucks swinging out are going to need a lot of room coming out of that property**. (20)**

Response 30: A traffic flag person will control truck traffic entering and leaving the site.

Comment 31: You found contamination at three feet deep. In that area, will you dig three feet deep just in that area? **(14)**

Response 31: If the sample at three feet had elevated concentrations, we would continue to dig until a confirmation sample demonstrates that the cleanup goal had been achieved.

Comment 32: On the contaminated site you said you tried to dig a foot below. What is the radius that you usually try to dig around that, the site? **(24)**

Response 32: Digging is conducted below where there is known contamination and then you take confirmation samples. To determine the areal extent of an excavation, an estimate is made based on nearby samples. Once the initial excavation has been completed, confirmation samples at the edges of the excavation are collected. If the results are above the cleanup level, then you excavate or step out in the direction where the results were high. This is an iterative process and may involve stepping out 1 or more times until the cleanup goal is achieved.

Comment 33: And you're going by EPA guidelines, then, as to what the threshold of acceptable? **(15)**

Response 33: DTSC used a combination of different screening levels and naturally occurring background levels. Screening levels include the USEPA Region 9 preliminary remedial goals (PRGs) and the California Human Health Soil Screening Levels (CHHSLs), which are numbers which were developed by the Office of Environmental and Human Health Assessment.

Comment 34: So when you say that your dieldrin contamination, up in the upper left, is the only site that you're going to feel that you need to remove, you're confident that all the rest of the property, even in between all of the other spots that you've tested, is dieldrin free, or dieldrin acceptable? **(15)**

Response 34: Sample results indicate dieldrin contamination is present in the indicated location. Based on other results no other areas of concerns were identified (Figure 4 of the Site Characterization Report).

Comment 35: If you lived next door on one of these residential properties that border three sides of BAREC, and this soil contamination removal plan was put forward to you as a neighbor, how comfortable would you be with that? **(15)**

Response 35: The levels that were found are above the screening levels established by U.S. EPA and the California Office of Environmental Health Hazard Assessment which are based on 1×10^{-6} excess cancer risk. DTSC feels that excavation and offsite disposal of the contaminated soils is the best remedy for the site since the impacted soil can be removed completely and quickly. There are mechanisms in place to prevent dust from leaving the site and trucks can be routed safely and not in residential neighborhood.

Comment 36: How can you make that assumption that this is the best alternative because, you know, for a planned residential development? **(17)**

Response 36: DTSC develops its cleanup levels based on the proposed use of the site.

Zoning

Comment 37: Protecting and preserving every meter of open space is hard work but is vitally important in our cities. Open space serves as a testament to our historical roots, a serene place to wallk and clear your mind in a crowded city and can serve as an educational center to learn about how to nurture the soil and ourselves. We have overdeveloped our land with population pressures and economic interests. It is now time for the County to build up and not out. Please put an urban growth boundary around BAREC for our children for their children's children. We cannot take it back once developed. Is it the best use of land for one individual to make a short term profit or for the entire health of the community to benefit? (**2, 3, 6, 9, 17, 21**)

Response 37: Comment noted. The City of Santa Clara is responsible for determining the future use of properties in this City; not DTSC.

Comment 38: DTSC said that the reason excavation was seen as the best alternative was that it is quick and was in line with the development plan. How can DTSC objectively protect the public and do their job safely when DTSC has the proposed (not approved) project in mind. DTSC's job is to make sure things are done right and done well, not at the will of the developers or their timelines. Why weren't the non-excavation alternatives discussed or explored? **(1, 2, 3, 6, 9, 17, 21)**

Response 38: DTSC does not have any jurisdiction on the development portion or planned use of the site. It is DTSC's objective to ensure the site is cleaned up to be consistent with the proposed land use; meaning more restrictive standards are applied to residential land use than commercial land use. Removing contamination from the site is the most protective way of cleaning-up a site, see response to 25 and 27 for further information.

Miscellaneous Issues

Comment 39: The depiction of the land is inaccurate, trying to minimize its size and value. **(3)**

Response 39: This figure was taken from the Environmental Systems Research Institute (ESRI) which develops geographic information systems for use throughout the United States.

Comment 40: If all of these chemicals were used on the site and it was known (the SaveBAREC group notified you over two years ago), why are you only getting involved now? What about all the disking that has been done for three or more years since the site was closed? **(3, 16)**

Response 40: DTSC has been involved in activities at this site since May 2003. Based on the levels found at the site, DTSC does not believe disking has significantly changed where contamination is located. Disking was done to control weed growth to meet fire department requirements. The cleanup activities are required to make the site available for potential residential use. In its current state, the site does not pose a threat to the neighborhood.

Comment 41: DTSC doesn't really care about whether there is cancer in the area and we were referred to the Northern California Cancer Center at (510) 608-5000. **(3)**

Response 41: As indicated in the public meeting, DTSC is not a health agency. The Northern California Cancer Center (NCCC) Greater Bay Area Cancer Registry is the agency that follows up on potential "cancer clusters". DTSC can not speak to potential past exposure. DTSC is responsible for ensuring that the property does not continue to create a risk to the community and that it is cleaned up in a manner which is protective of public health and the environment.

Comment 42: Since the methods of the existing soil samples is in question and the consultant was hired and paid for by the State who has an interest on putting a housing development on the site, it is just appropriate that a new soil sample test be done. A number of names were given during the meeting. **(3)**

Response 42: The normal practice is for an owner/developer to hire their own consultant/contractor to investigate a site. DTSC, as the oversight agency, has the authority to ask for additional information or tasks to be conducted as we have on this site or on other sites. DTSC also has the obligation to ensure that the site is adequately characterized to define the extent of contamination at the site. DTSC does not believe that additional testing is necessary at the site with the exception of the proposed confirmations samples which will be collected after excavation has been conducted.

Comment 43: On page 4-61, the Draft EIR states: "However, dieldrin was not considered a chemical of potential concern because only 3 of the 60 soil samples had concentrations above PRGs in surface soils and the concentrations were of limited horizontal and vertical decent. Therefore, dieldrin in the onsite soils would not pose a significant adverse human health risk effect (Environ 2003)." DTSC insults the public by saying there is little contamination at the site. Also, here the samples of dieldrin that are off the charts are right where the proposed public park is and in the "children's tots" area. You think people are going to want to know-- that you took out the minimum about of a deadly toxin and did not remove it completely?

Response 43: This comment was forwarded to the City of Santa Clara, the Agency responsible for the CEQA document. DTSC does consider dieldrin a contaminant of concern.

Comment 44: The Draft RAW that the public has access to is about 15% the size of the actual one? Due to this one item alone, you should reset the public's timeline to examine the document. **(3)**

Response 44: Environ, the consultant for the Department of General Services (DGS) delivered two copies of the draft RAW to the library on March 24, 2006 (Monday 10 A.M.)**.** DTSC found out about the smaller version of the RAW at the public meeting. On April 15, 2006, DTSC delivered another copy of the complete draft RAW to the library.

Comment 45: Why did you release the Draft RAW in the middle of the Draft EIR? This makes it so the public needs to look at all of the 1,500+ pages at the same time. You have months to prepare this, how can you expect the public to read it and understand it in 30 calendar days? **(3)**

Response 45: The City's CEQA was broader in scope and DTSC as a responsible agency for the project is expected to make it available to the public when possible within the same time frame of the Draft EIR.

Comment 46: How much are your services costing the State and the tax payers? How much has this cost to date? What is the projected cost of this effort (just the State's part)? What is the estimated cost of the excavation and removal of the soil? What is the total cost to clean the soil using the methods describe? **(3)**

Response 46: DTSC can only respond as it relates to our oversight costs. The total cost of DTSC's oversight to date is approximately $43,000. The total estimated cost for the cleanup is approximately $870,000. DTSC's costs will be paid for by DGS.

Comment 47: It appears that Mr. Dan Potash is both working for the State, in the marketing of the property, and also managing the environmental portion of the site. And, he is in competition with major environmental consultants and engineers which he does not have any background on. Why is Mr. Potash preparing the RAW and at the same time selling the BAREC for the state? **(7)**

Response 47: Anne Gates with Environ Corporation is the technical consultant hired by DGS for this project. Anne is a Registered Professional Engineer in the State of California who has many years of experience in the evironmental field. She was hired by the Department of General Services to prepare documents as required in the RAW.

Comment 48: Now, what about vapor intrusion. Has this, because three years ago we all knew about radon gas, but, you know, three years ago vapor intrusion was a new issue. With the decay of these products now coming up through soil gas, are we testing the residents around this area, have we done something like we did out at Watson Park where we actually did blood samples for the, the people who are there? And if, if so, what does that, what does that look like? **(12)**

Response 48: DTSC did not require vapor sampling because dieldrin and arsenic do not evaporate into the air, instead they cling to the soil. The contamination at Watson Park is lead. DTSC is not the regulatory agency that conducts blood testing, however, most counties do have a blood lead testing program. However, arsenic and dieldrin are not chemicals which you would test for in blood.

Comment 49: Is this considered a Brownfield site? **(3, 15)**

Response 49: Yes.

Comment 50: Whose responsibility is it or was it to notify the DTSC of the toxins when the site was closed in January of 2003 **(16)**

Response 50: There's no responsibility or requirement to notify DTSC of contamination. Many properties get cleaned up with city or county oversight, or U.S. EPA oversight, so there's not a legal requirement that DTSC has to be the oversight agency or has to be informed that there's contamination from applied pesticides. Chemicals that are applied as part of normal agricultural operations are not generally tested for until a property is going to be no longer used for agriculture.

Comment 51: Does DGS have any responsibility for the chemicals on the soil? **(16)**

Response 51: The State of California is considered to be the party responsible for the cleanup since they own the property where contamination is present.

Comment 52: I just have a question about the arsenic. Is it organic or inorganic? **(18)**

Response 52: We have not speciated between inorganic or organic. We only did total arsenic testing.

Comment 53: Do we have historical buildings on that property. My question is, will any of the buildings be affected during your excavation of your soil removal? **(20)**

Response 53: The buildings are proposed to be demolished as part of the redevelopment project, not part of the cleanup project. So building demolition and building issues are not something that DTSC is responsible for requiring or, or permitting.

The property owner has indicated to us that they want to clean up the property to residential standards. Our job is to ensure that if they do cleanup, that it meets the standard and it is done safely. If the, the site is proposed for some other use, generally the cleanup levels are higher. The land use is within the jurisdiction of the City of Santa Clara not DTSC.

Comment 54: Because there are known contaminants on the site now, are you going to be looking at making any advice to the Department of General Services regarding that disking activity? **(12)**

Response 54: Based on the comments received during the meeting, DTSC worked with DGS and the City of Santa Clara to mow the site while spraying water to minimize the dust in August 2006 and July 2007. This method was chosen, instead of the traditional disking, based on concerns from the public as well as other governmental agencies.

Comment 55: I was told behind this there's actually a, like a, a river bed, creek bed that actually goes through. Could or could not, this is going back 15 years ago, it was told to us when we purchased, when I purchased my property. So I'd like to find out if there is a leach field where. And should I be concerned, as an adjacent resident, that it's in my property? **(23)**

Response 55: There was a pond that was used on the BAREC site which was called the evaporation pond. They would take the application equipment that they used to apply the pesticides, they would rinse that out and the rinsate would go into the evaporation pond. There was extra sampling done in that area down to seven to ten feet.

Comment 56: If I sell my property do I have to make any disclosures regarding the contamination? **(23)**

Response 56: Real Estate Disclosure is covered under Seciton 25359.7 of the Health and Safety Code for owners of non-residential real properties and Civil Code,1102 covers disclosures for residential properties. Being adjacent to a property which has been cleaned up should not affect your property value. Please address this question towards your realtor.

Comment 57: We as neighbors will be notified when they will -- if this happens, when it will start? And how will we be notified? And we, as neighbors, will we have a number that we can call? **(24, 26)**

Response 57: DTSC will issue a work notice about a week before our activities begin. It will include our contact information and we want to hear any complaints regarding dust or if a tarp or fence blows down so that we can follow up.

Also the Bay Area Air Quality Management District is one of the places to call and make complaints regarding dust. They will also follow up.

Comment 58: Has the USGS been involved with the mapping of the area for the groundwater purposes? **(25)**

Response 58: The USGS has not been involved. The groundwater at the site is between 20 and 30 feet below ground surface and flows to the east. The deeper confined aquifer is encountered beneath an extensive aquitard at depths greater than 300 feet below ground surface.

Comment 59: I would suggest a third party soil test be done, soil food, what was mentioned by Katheryn, they're experts in soil testing, they have labs all over the world including up in Oregon, which is probably the one closest to us. I would suggest that you guys recommend that DTS, or Department of General Services, fund that experiment. Elaine Ingham is willing to do that. She's actually reduced her rate to actually look at the soil, and I would suggest you take her up on that offer. **(3, 16)**

Response 59: Confirmation sampling will be conducted to ensure that concentrations at the site meet the cleanup goals. State law requires that a certified laboratory be used to analyze all the results.

Comment 60: The University has a long standing policy of a committee to review all proposals for research and to publish the results of that publicly funded research. And, that DTSC secure all documents under the appropriate UC authority. **(8)**

Response 60: As part of the information submitted, description of research activities where and how was used was provided. Additionally, 90 chemicals were tested. DTSC does not feel it is necessary to collect the historic research material.

Comment 61: I've been to a couple of the city council meeting and, and I have to say I'm deeply, deeply troubled. I'm not necessarily implying by this board, because you're obviously concerned with cleanup. But I see on the site history the only option is site proposed for development of residential housing. And I just have to tell you as a citizen who is newly learning about this process that the decisions have already been made, that this is just kind of a bit of a hoax of having public come out and comment. **(21)**

Response 61: Comment Noted.

The property owner has indicated to us that they want to clean up the property to residential standards. Our job is to ensure that when cleanup is done, it meets the applicable standard and it is done safely. Cleaning up the site to unrestricted standard is the highest standard of cleanup so DTSC believes it can be used for any use. If the site is proposed for some other use, generally the cleanup levels are higher. Specifically, the decision on land use is within the jurisdiction of the City of Santa Clara not DTSC.

List of Commentors:

(1) Form Letter dated March 29, 2006 from the following parties: Victor Aldana, Lucille Andueza, Gino Barsante, Dorothy D. Cabonzy, Albert Chan, Jeanie Chan, Stephanie Chang, William Christman, Palma Christman, Angelica Delgado, Angela D'Orfani, Marilyn Dort, Jean Elvin, Becky McIntyre, Marguerite Lee, Robin Lee, David Lehr, Agnieszka Mazur, Lauren McCutcheon, Monica Mendez, Catherine Paz, Janet Petty, Eric Quetingco, Cheryl Quetingco, Zaim Sibic, Vesna Rozic-Sibic, Traci Suyeishi, Kirk Vartan, and Sue Woo.

(2) Form Letter dated March 29, 2006 from the following parties: Victor Aldana, Lucille Andueza, Albert Chan, Dorothy D. Cabonzy, Curtis Chang, Chris Hackler, Jaennie Chan, Marguerite Lee, Robin Lee, Monica Mendez, Eric Quetingco, Cheryl Quetingco, Traci, Suyeishi, Kirk Vartan, and Sue Woo.

(3) E-mailed comments dated April 21, 2006 from Mr. Kirk Vartan

(4) Letter dated April 20, 2006 from Mr. Joe Whaley

(5) Letter dated April 21, 2006 from John Farrow, M.R. Wolfe and Associates

(6) E-mail dated April 24, 2006 from Cindy Russell

(7) Letter dated April 21, 2006 from Kathryn Mathewson

(8) E-mail dated April 20, 2006 from Sharon McCray.

(9) E-mail dated April 18, 2006 from Carolyn Straub and Steve McHenry

(10) E-mail dated April 10, 2006 from Alison McEntire

(11) Letter dated April 19, 2006 from Frank R. Freedman, PhD, Envirpcorp Consulting

(12) Oral comments received from Cameron Colson at the April 13, 2006 public meeting, transcript pages 14 – 17, 63 - 64

(13) Oral comments received from Frank Freedman at the April 13, 2006 public meeting, transcript page 18, 87,

(14) Oral comments received from Joe Sunseri at the April 13, 2006 public meeting, transcript pages 19 – 20, 61 – 63, 65.

(15) Oral comments received from Linda Perrine at the April 13, 2006 public meeting. Transcript pages 21 –25, 43, 85 – 87, 90 – 92, 96 - 98.

(16) Oral comments received from Kirk Vartan at the April 13, 2006 public meeting. Transcript pages 26 – 31, 79 – 85, 93 - 95.

(17) Oral comments received from Steve Hazel at the April 13, 2006 public meeting. Transcript pages 31 – 42, 88 - 90.

(18) Oral comments received from Dick Sheehan at the April 13, 2006 public meeting. Transcript pages 42 – 43.

(19) Oral comments received from Kathryn Mathewson at the April 13, 2006 public meeting. Transcript pages 45 – 51.

(20) Oral comments received fromJerry McKee at the April 13, 2006 public meeting. Transcript pages 52 – 54.

21) Oral comments received from Margo Wixsom at the April 13, 2006 public meeting. Transcript pages 55 – 59, 92 - 93.

(22) Oral comments received from Manuel Meudible at the April 13, 2006 public meeting. Transcript pages 59 – 61.

(23) Oral comments received from Pat Sunseri at the April 13, 2006 public meeting. Transcript pages 65 – 68.

(24) Oral comments received from Jane Matulich at the April 13, 2006 public meeting. Transcript pages 69 – 74.

(25) Oral comments received from Ron Becksted at the April 13, 2006 public meeting. Transcript pages 74 – 78.

(26) Oral comments received from Barbara McCune at the April 13, 2006 public meeting. Transcript pages 78 – 79.